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A MONTHLY JOURNAL of ENGINEERING PROGRESS

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JULY 1920

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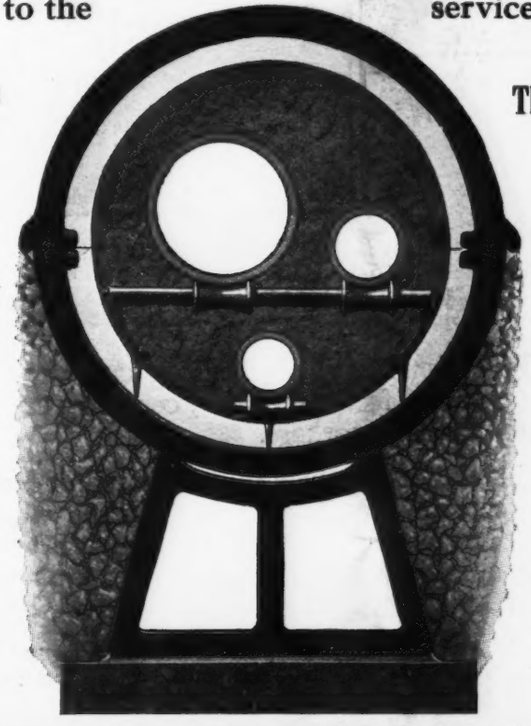

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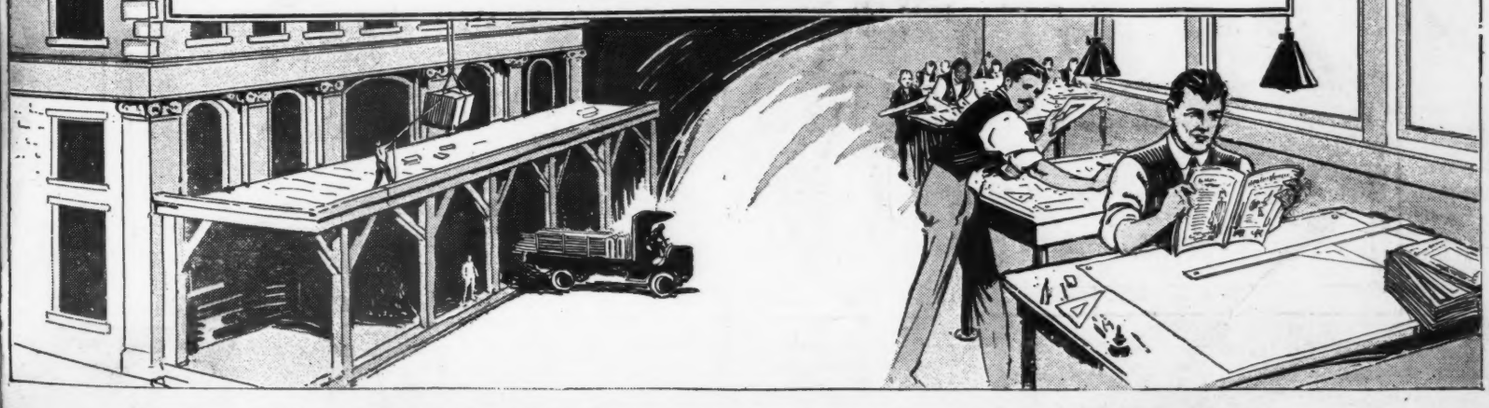

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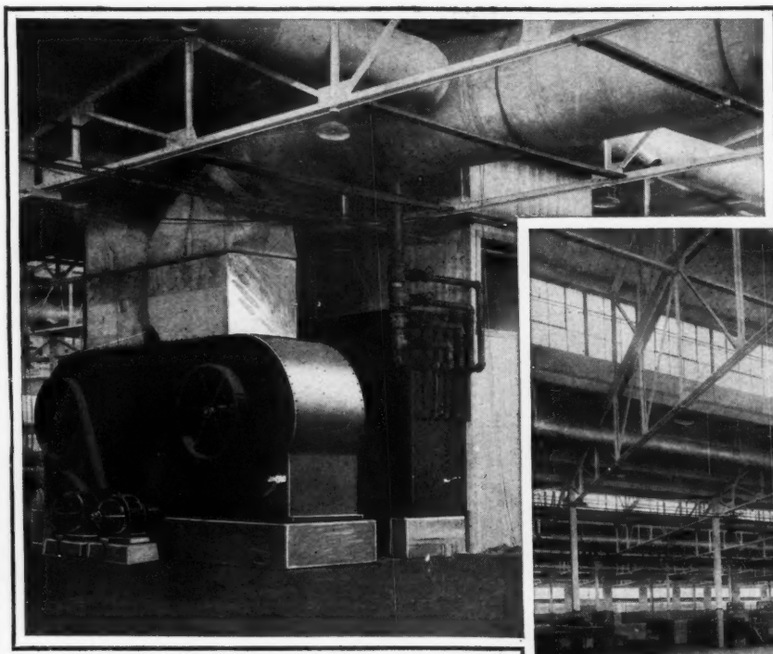

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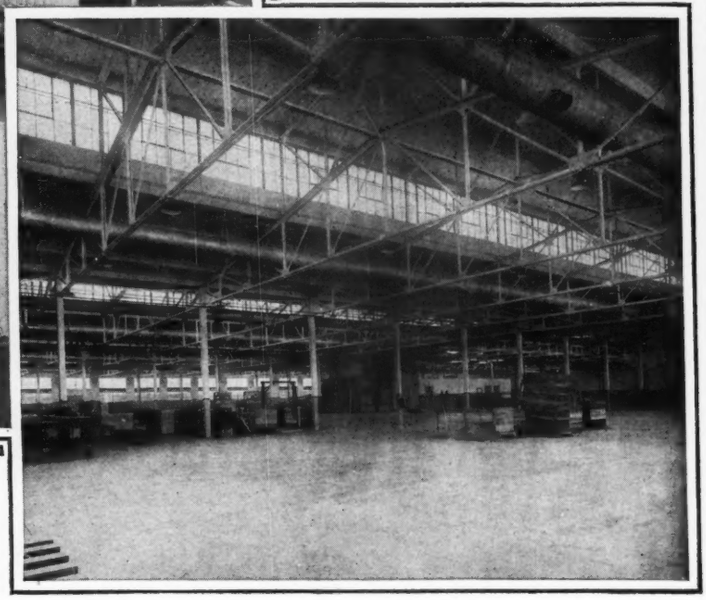

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The Heating and Ventilating Magazine
A MONTHLY JOURNAL of ENGINEERING PROGRESS
JULY, 1920

AN IMPROVED FAN BLAST SYSTEM OF HEATING AND VENTILATING

By Albert R. Klein, C. E.

Editor's Note—*This paper intends to show the advantages gained in distribution of heat and fresh air, in reduction of heat losses and horse power and in the costs of new fan blast heating, ventilating or cooling systems if they are provided with special "circulating" air outlets. It is further shown that existing systems can be materially improved in regard to distribution of heat and air and that, in certain cases, an increase of the heating capacity can be obtained by the application of these circulating outlets.*

IN the following an improved heating and ventilaing system is described in which air is used as the heating medium; it possesses special features by which it differs from the ordinary fan blast system and by which the disadvantages of the latter are practically eliminated. It may be said that the new fan blast system is not only superior to the present systems of its own kind, but that it may also replace steam and water heating systems in buildings where the fan blast system has hitherto been impracticable or too expensive.

The salient feature of the new fan blast system lies in the outlets which transmit the air to the interior, two typical forms of which are shown in Figs. 1, 2 and 3. In these outlets the hot air draws, by an injector action, air from the interior into a short duct, the ends of which are placed at different levels. The hot air mixes itself with the air drawn from the interior and the mixing is done just prior to the discharge of the mixture into the interior. The air withdrawn from the interior passes, therefore, only through a short duct and need not pass through the conditioning apparatus, the blower fan and the main duct system, as is usually necessary in fan blast heating systems of the present type. On account of the circulating effect of these special outlets between their two ends which they exert upon the air of the interior, they may properly be termed "circulating outlets."

ADVANTAGES OF NEW METHOD.

From this mixing of hot air with air taken from the interior just prior to the discharge into the interior and from the resulting circulation of air in the interior there results a number of advantages which cannot be obtained either by the present air heating systems or, in fact, by any other of the existing heating systems except at extraordinary expense.

With such outlet it is possible:

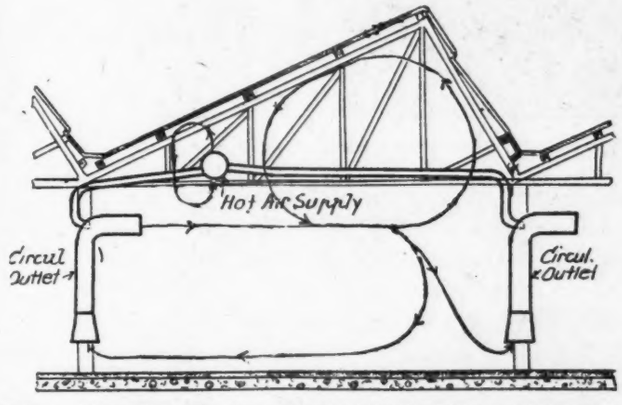

FIG. 1—COURSE OF AIR WITH CIRCULATING OUTLETS IN BUILDING OF SAWTOOTH CONSTRUCTION.

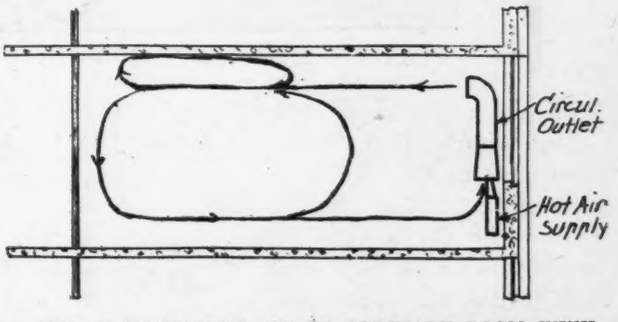

FIG. 2—COURSE OF AIR IN ORDINARY ROOM WITH CIRCULATING OUTLETS.

1. To heat the air coming from the heating apparatus to much higher temperatures than hitherto considered advisable.

2. To reduce the sixe of the blower fan, heating ducts and air washer (where used) to one half or even less of those of the present systems.

3. To employ air heating systems in buildings, such as office buildings, loft buildings, etc., where hitherto their application has been either not practicable or too expensive.

4. To discharge into the interior large quantities of air the temperature of which can be much lower than that of the air discharged by present systems.

5. To reduce in many cases the first costs and the costs for horse power as compared to those of a system of the present type.

From the fact that the air drawn from the interior into the outlets is taken from the lower part of the zone of occupancy the following advantages result:

6. A practically uniform temperature and distribution of fresh air throughout the interior.

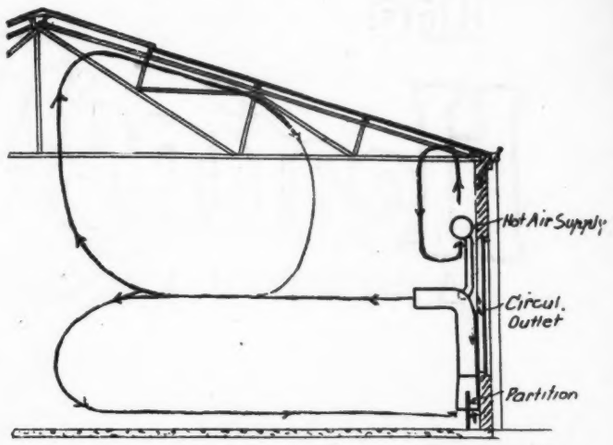

FIG. 3—COURSE OF AIR IN LARGE INTERIORS WITH CIRCULATING OUTLETS.

7. Heating and renewal of the layers of air close to the floor without overheating the upper layers and without draft to the occupants.

8. The large amount of heat usually necessary for the roof and walls does not pass through the zone of occupancy.

9. Reduction of heat losses through the roof and walls.

10. Draftless circulation of the hot or fresh air through the zone of occupancy and in absolutely positive manner.

11. Existing heating and ventilating systems where inconveniences from drafts, overheating of the upper zones and insufficient heating of the lower zones or poor ventilation of the zone of occupancy are obtaining, can be improved by changing the ordinary outlets to circulating outlets, as shown in Figs. 1, 2 and 3

FIG. 4—TYPICAL INSTALLATION OF FAN BLAST SYSTEM WITH CIRCULATING OUTLETS.

12. Existing fan blast systems can be increased in their heating capacity by changing the ordinary outlets to circulating outlets.

13. In cooling and ventilating systems, such as are used for theatres, audience halls, school houses, etc.,

the circulating outlets greatly improve the uniform and draftless distribution of the cool fresh air.

The new heating system characterized by the use of the circulating outlets is protected by U. S. A. and foreign patents.

UNIFORM TEMPERATURE IN INTERIOR NEAR FLOOR AND ROOF.

If we consider a building in which a large part of the heat is lost through the roof and where, therefore, a large quantity of heat must be transferred to the roof surface, we find that this can be accomplished in different ways. The zone near the floor could be heated directly and uniformly either by heating the floor underground or by providing numerous small radiator units throughout the interior in the lower part of the zone of occupancy. In the first case, the initial costs are prohibitive; in the second case it is impracticable to place many small radiator units all over the floor. The usual practice is to provide large units of radiators near walls and columns which are creating individual upward currents of upward currents of hot air and downward currents of cool air, causing large heat losses through the roof and hot zones and cold drafts in the zone of occupancy. In both cases the total quantity of heat needed for the roof which, in the ordinary one-story building, is usually about three times as much as that needed for the floor and zone of occupancy, passes through the latter and is liable to create locally considerable overheating of that zone.

Another manner of heating the roof is by providing radiators for the roof independently from those needed for the zone of occupancy. This way is wasteful in first cost and usually causes overheating under the roof and consequently large heat losses.

A fourth way finally of heating the roof would be to distribute a large quantity of moderately heated air in the interior, spread out horizontally and evenly as possible. If the air would be distributed above the zone of occupancy and if part of that air could be made to traverse the zone of occupancy and the zone near the floor, then the most economical and the most agreeable system of heating the roof and interior would have been found.

FIG. 5—TYPICAL INSTALLATION OF OUTLET SIMILAR TO THAT SHOWN IN FIG. 2.

This is exactly what the new system does. The hot air, coming from the heating apparatus, is mixed with a quantity of moderately warm air from the interior, the resulting mixture, the temperature of which is less than 100° F., even in extreme weather, is discharged horizontally above the zone of occupancy and can, on account of the large quantities of air, be spread horizontally, by means of diffusers, so as to cover the entire floor area. The large quantity of air discharged through the outlets, mixes rapidly with air of the interior, thus further reducing its own temperature. The resulting numerous currents of warm air rise

slowly to the roof, intercept the currents of cooled air flowing downward, strike the roof at slow velocity and at low temperature, reduce the temperature losses through the roof to a minimum and create in the upper zone of the interior uniform conditions of temperature and air distribution. At the same time, part of the air mixture discharged through the outlets is drawn into the lower openings of the latter and thus forced to pass through and heat the zone of occupancy and particularly the zone near the floor.

SYSTEM PROVIDES FREQUENT AIR CHANGE IN ZONE OF OCCUPANCY.

It is evident that through the action of the circulating outlets there must result an almost uniform temperature throughout the interior of the room thus heated. The quantity of the air withdrawn from the interior can easily be made so that a change of air takes place in the zone of occupancy every five to ten minutes. If the lower inlet openings are placed near the floor, about 2 feet from the floor level, the suction from the outlets will draw in at first the layer of air within this zone. Ordinarily, when the system is started this air will be several degrees lower in temperature than the upper layers of air and the outlets will remove at first this cold air near the floor before they will draw on the warmer and lighter air of the upper levels. When the cold air near the floor has been removed, the air from the upper levels will be forced down and a continuous circulation of warm air from the upper to the lower levels of the interior will take place. As the air which is forced down from the upper levels has no possibility of loosing any of its heat, it is evident that within a short time after the system has been started the temperatures at the upper and lower levels must be practically uniform.

THEORY BORNE OUT IN PRACTICE.

Actual measurements of temperature in a one-story factory building in which circulating outlets were installed (see Figs. 1 and 4), have shown the correctness of the above contention. The building covers an area of 170 x250 ft., is covered by a saw-tooth roof, the roof being constructed of 2-in. wood planking with a ¼-in. felt insulation and a five-ply felt and tar covering. The skylights are of steel and double-glazed, the floor has a 9-in. concrete base with a 3-in. wooden top. The lowest and highest parts of the roof were 12 ft. and 23 ft. respectively, above the floor level. The air was introduced 9 ft. and withdrawn 2 ft. above the floor; the temperature of the heated air was 130°F., that of the air discharged 98°F., and the quantity of the air withdrawn through the outlets was about equal to that of the hot air supplied When the lower intakes of the outlets were open, the temperature differences at points 3 ft. and 14 ft. above the floor were from 1° to 3°F., with the lower openings closed the differences were from 5° to 8°F.

LARGER QUANTITIES OF AIR DISCHARGED AT LOWER TEMPERATURES.

The heat losses through the roof will be the less the smaller the difference is between the temperature immediately beneath the roof and the outside temperature. The minimum of heat losses will be obtained if the temperature of the air near the roof on the inside is equal to that in the zone of occupancy. It is clear that a further drop of the temperature in the upper levels is not desirable as this would cause down drafts of cool air into the zone of occupancy. The upper layers of air should be even somewhat warmer than the lower ones.

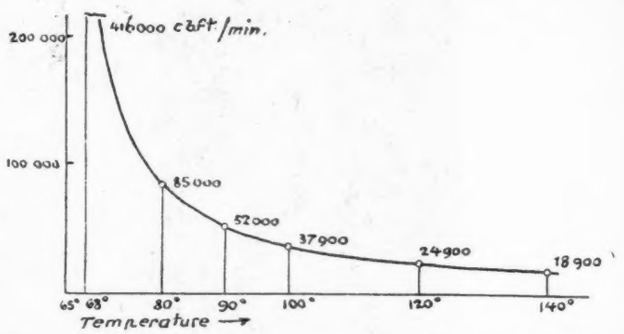

FIG. 6—DECREASE IN QUANTITY OF HEATED AIR REQUIRED WITH RISE IN TEMPERATURE IN A GIVEN CASE.

It is interesting to investigate how small a rise of temperature in the heated air is sufficient to make up the loss of heat through a roof and what air quantities are needed. If we take for instance, a 2-in. plank roof with a five-ply tar and felt covering, we find that the heat loss would be 0.25 B. T. U. per square foot of roof per degree difference in temperature per hour. At an inside temperature under the roof of 68°F. and an outside temperature of zero the heat loss per hour would be 17.00 B. T. U. If we now assume a drop in temperature of only 3°F. in the air of the interior through the cooling effect of the roof, then we would need 312 cu. ft. of air per hour at 68° F. to heat 1 sq. ft. of roof surface. If we take the heat loss through the floor as one-third of that through the roof and if we further assume that one outlet covers a floor area of 1,000 sq. ft., then we find that 6933 cu. ft. of air at 68° F. would be needed per minute to heat the floor and roof. The temperature under the roof could then not be higher than 68°F. and the loss of heat through the roof and floor would bring the temperature of the air to 65°F.

In practice it has been impossible hitherto to supply such large quantities of air because it would make the heating apparatus and the duct system much too large and expensive. Assuming in the above instance an outlet velocity of 1,000 ft. per minute, one outlet alone would require a 36-in. pipe and a building of 300x200 sq. ft. of floor space would need 418,000 cu. ft. of air per minute for roof and floor alone. In actual present practice the air would be delivered to the building probably at a temperature of 140° F. and the

quantity of heated air required would be 18,900 cu. ft. per minute.

Fig. 6 shows the quantity of heated air in the above example decreases as the temperature rises. We find that, while the quantity of air needed at a temperature of 140°F. is 18,900 cu. ft. per minute, it is twice as much at a temperature of 100° F.; then it rises rapidly so that at a temperature of 80° F. the air quantity is already about five times, at 68° F. about 25 times that for a temperature of 140°F.

It is, however, not necessary to make the difference between the inside temperature and the temperature of the discharged air as small as 3° F. because the heated air will, to a certain extent, depending upon the form of the outlets and the discharge velocity of the hot air, mix with the air of the interior, and, therefore, have its temperature reduced. However, it is plain that the lower the temperature of the discharged air, the closer the ideal conditions, outlined above, will be approached.

With the circulating outlets we can get pretty near to those ideal conditions. If we, for instance, assume that the air be heated to 140°F. and that we draw from the interior about three times the quantity of the heated air, a ratio which can, by proper design of the outlets, be obtained without difficulty, then we deliver the mixed air into the interior at a temperature of 81.8° F. The quantity of mixed air for each outlet in the above example would then be 1270 cu. ft. per minute, that for the entire building 76,200 cu. ft per minute; the diameter of the individual outlets would be 16 in. Considering that this large quantity of air mixes itself again with the air in the room, we can reduce by means of the circulating outlets the temperature under the roof practically to the minimum desirable.

ADDITIONAL FIRST COST AND HORSE POWER IN THE BLOWER REQUIRED BY CIRCULATING OUTLETS.

Of course, the circulating outlets will require additional first costs and additional horse power in the blower, but it will be shown later that these are by no means prohibitive and will make the system cheaper if we consider the saving of heat and the additional advantages resulting from the draftless circulation of the air through the zone of occupancy and the uniform heating of the interior.

From the above it is evident that the use of the circulating outlets effects in itself a saving of heat. Furthermore the circulation of air from the upper to the lower levels acts as an almost instantaneous indicator as to the proper quantity of heat necessary for the building under the varying conditions of outside temperature and other influences. If either too much or too little heat is supplied the temperature in the zone of occupancy rises or falls quickly and the supply of heat can be regulated accordingly. This is especially easy in an air heating system where the shutting off or adding to the supply of steam in the heating apparatus makes itself quickly felt in the temperature of the hot air delivered.

(*To be concluded in August issue*)

The Problem of Measuring Air Velocities.

How far it is necessary to go in calibrating anemometers when measuring air velocities is explained in the report issued by the University of Illinois on the progress made to date in connection with its tests of warm-air furnace heating.

There are two possible methods, states the report, of determining the amount of air actually flowing in through the inlet and out through the leaders and stacks of a warm-air furnace heating plant. The first and most obvious method would be to attempt to measure the velocities directly, using a Pitot tube and a sensitive gauge. This has been attempted and a very sensitive and accurate gauge, reading to 0.0001 in. of alcohol, has been developed by F. G. Wahlen, research graduate assistant. When it is remembered that the actual velocities range from as low as 2 ft. to a maximum of seldom over 5 ft. per second in these systems, it will be apparent that no ordinary differential gauge will be of the least value in making direct measurements.

The second method which may be used is to employ a simple field instrument which may be used quickly, is simple in construction and easily replaced. Such an instrument must, of course, be accurately calibrated and frequently checked; this is the method which has been in use in this particular investigation from the start. It is the unanimous opinion of the men on the staff that this method is the only workable one, and that its only limitation is the inaccuracy of the Pitot tube, or orifice used in its calibration.

The report shows the practical results obtained with this scheme of measurement, using calibrated anemometers, run against Pitot tubes and the Wahlen gauge. This gauge was found absolutely essential in this calibration work.

In one test the weight of air entering the inlet pipe per minute was 60.15 lbs. and the sum of the weights of air leaving ten outlet register faces at the same time was 59.75 lbs., a discrepancy of only 0.65%. In another test the results were not so good, since the weights in and out fail to check by $64.31 - 60.30 = 4.01$ lbs., or a discrepancy of 6.6%. This discrepancy can be cut down one-half by assuming that the true weight is the mean of the inlet and outlet weights.

The investigators are planning to secure still greater accuracy in the calibration of their anemometers. An attempt will be made to secure a fundamental measurement of air that is more accurate than can be made by either Pitot tube or orifice, which methods, it has been found, do not check each other when placed in the same line by from 5% to 15%. The details of this scheme have not yet been published.

ELIMINATION OF NOISES IN HEATING AND VENTILATING SYSTEMS

Notes on the Cause, Effect and Prevention of Mechanical Air and Water Hammer Vibrations

III

(*Continued from June issue.*)

Air chambers may be purchased of cast-iron or copper, pear shaped, with the small end for attaching to the pump, or one can be made of pipe and fittings by installing a tee in the pipe with its outlet connected to a pipe extended upward and closed with a cap. They are attached either to the pump just outside of the discharge valves or to the discharge side as near the pump as possible. Drip pockets may be inverted and used as air or vacuum chambers.

It is a good practice to tap the air cylinders for gauge glasses so that the quantity of air is visible to the engineer at all times. Water which has gradually taken the place of the air may be drawn off through a cock tapped into the bottom of the air chamber, after which air will re-enter through this same cock and it may then be closed. In a slow running pump, the air carried along with the water may be all that is required to supply the air chamber; in any event, the water level should be kept at about one-fourth the height of the air chamber.

The volume of the air chamber depends upon the type, speed and pressure head of the pump, and length of the discharge pipe. On single pumps it should be equal to three or four times the volume of the water cylinder, but on "duplex' one-half to one-third the volume of the water cylinder is sufficient. The size of the air chamber should be increased for high pressures and piston speeds, as in fire pumps. Vacuum chambers should be one-half the size of the air chamber for the same conditions.

Vacuum chambers aid in the reduction of slip and act in a manner similar to air chambers. They should be connected to the suction pipe in such a way, as in Fig. 22, to receive the impact of the column of water and made with a volume greater than that of the suction pipe, the size being increased by length, rather than by diameter.

A vacuum chamber is often a necessity with high lifts and long runs having numerous bends and valves which cause resistance. Unlike the air chamber, the air in a vacuum chamber is at a pressure less than atmosphere. In some cases, the atmospheric pressure may not be sufficient to fill the pump as fast as the piston moves during suction, so that with a reversal of the piston it meets the inflowing water, causing water-hammer. The air in the vacuum chamber overcomes this difficulty by expanding during suction and forcing water into the pump, while at the same time atmospheric pressure forces water through the suction pipe because of the lower pressure within the chamber. When the pump discharges, the chamber is again partially filled with air and compressed.

WATER-HAMMER IN BLOW-OFF TANKS.

Water-hammer may also be caused by blowing-off a boiler into a blow-off tank having improper piping connections, with results dangerous to life as evidenced by two well-known instances within the last few years.

The blow-off pipe from the boiler should enter the tank at a higher point than the discharge pipe from the same; otherwise with the tank filled, cold water might enter the inlet pipe, causing water-hammer when the boilers are blown-off.

Water may also be present in the tank, due to the discharge pipe becoming stopped up, or the latter may be with such a long run and insufficient size that it will fail to liberate the discharge as received. Again, on rainy days, and with but little grading of the pipe to the sewer, water from the latter may back up and enter the tank. It is best to vent the tank with a large size of pipe, in particular if this has a long run to the roof, and, above all, a tank of steel should be used rather than cast-iron, except that this last precaution may be unnecessary when only low pressures will ever be used.

MECHANICAL VIBRATIONS.

Doubtless we are all more or less familiar with the cumulative effort of vibrations, how one small impulse added to another, builds up after a period of time and creates such an enormous vibrating force that large masses are perceptibly shaken. This is why soldiers break step when they come to a bridge and why an elephant will first place one foot on a bridge before crossing so as to test out the natural period of its vibrations. The elephant will then walk across, adapting a step with a different period of vibration.

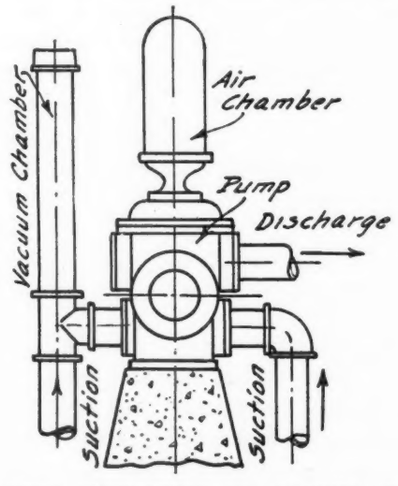

FIG. 22—PROPER CONNECTION OF VACUUM CHAMBER TO SUCTION PIPE OF PUMP.

Dogs with their light but rapid trotting often set up sympathetic vibrations which are quite noticeable in suspension foot bridges. Windows adjacent to subway blasting are braced in a manner at the center familar to many of us, but even a violin with the correct fundamental note can set up considerable vibrations if suitable conditions of resonance exist.

The plaster in houses located near railroad crossings often becomes loosened owing to the repeated whistle of locomo-

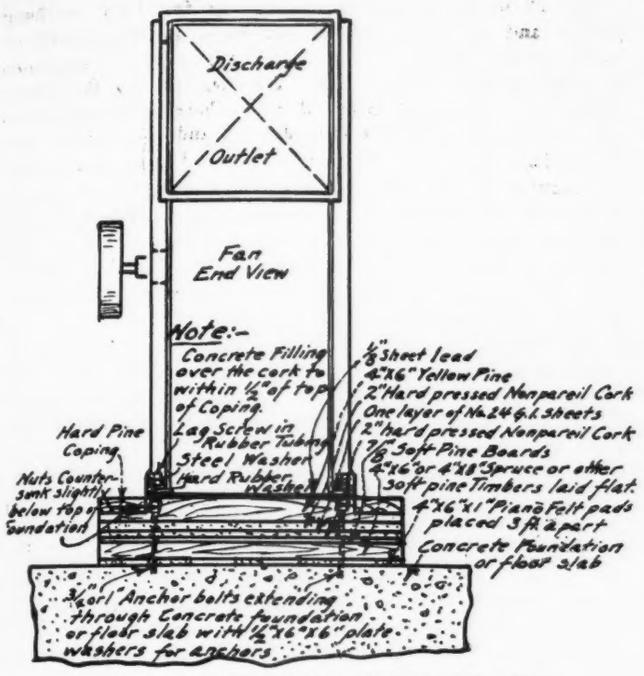
Discharge
Outlet
Fan
End View
Note:-
Concrete Filling over the cork to within ½" of top of Coping.
Lag Screw in Rubber Tubing
Steel Washer
Hard Rubber Washer
Hard Pine Coping
Nuts Countersunk slightly below top of foundation
⅛" Sheet lead
4"x6" Yellow Pine
2" Hard pressed Nonpareil Cork
One layer of No. 24 G.I. Sheets
2" hard pressed Nonpareil Cork
⅞" Soft-Pine Boards
(2"x6" or 4"x8" Spruce or other soft pine Timbers laid flat.
4"x6"x1" Piano Felt pads placed 3 ft. apart
Concrete Foundation or floor slab
¾" or 1" Anchor bolts extending through Concrete foundation or floor slab with ½"x6"x6" plate washers for anchors.

FIG. 23—FAN OR MOTOR FOUNDATION THAT MINIMIZES NOISE.

tives, the vibration frequency of the engine whistle being "in tune" with the plastered walls. A more striking instance of sympathetic vibrations occurred a few years ago on a Brooklyn church when a negro band under the combined influence of religion, harmony, and Gordon gin, started up such a strong vibration that the building collapsed.

These examples furnish actual cases resulting from impact, due largely to what might be termed the cumulative effects of synchronous vibrations, a factor which might often prove disastrous.

It is sometimes practically impossible to ascertain the source of vibration. If two engines run at the same speed, they

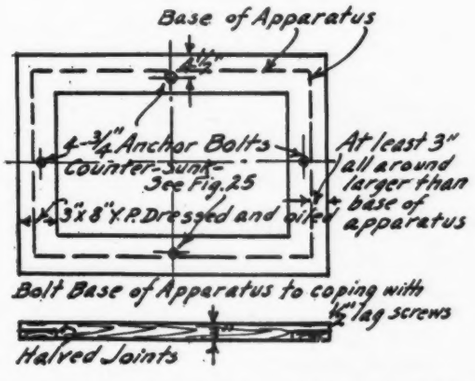
Base of Apparatus
4½"
4-¾" Anchor Bolts Counter-Sunk See Fig. 25
At least 3" all around larger than base of apparatus
3"x8" Y.P. Dressed and oiled
Bolt Base of Apparatus to coping with ½" lag screws
Halved Joints

FIG. 24—FRAMING FOR FANS, OVERHUNG PULLEYS AND MOTORS TO PREVENT NOISE.

may at times come into perfect synchronism, both being on the same stroke at the same moment, and passing their centers simultaneously. Such a condition may be easily remedied by slightly increasing the speed of one engine and lowering the speed of the other.

Machinery produces waves which are noted either as noise or vibration, in accordance with their frequency. Such vibrations are primary and secondary. The first of these is communicated directly to the air and the second is better known as foundation vibrations, since they are transmitted through the base of the machine to its foundation and from thence to the floor, walls and other masses.

If any particular condition is to be remedied by isolation or insulation, as the case may be, it is essential that the nature of these vibrations be well understood. A motor will produce primary vibrations which take place only within the room or adjacent rooms, if the doors are opened between. These vibrations have not sufficient energy to appreciably vibrate thick walls or massive floors, nor can they readily pass through ordinary building construction in which there are no openings. Enclosure of the motor to prevent the travel of sound waves will eliminate the difficulty from primary vibrations but it is more often the secondary vibrations which are the cause of trouble, various methods of sound insulation being used to prevent their transmission. Resilient materials may be placed underneath the machine so as to prevent transmission to the foundation, or the letter may be made of so great a volume and weight that all vibrations will be absorbed.

Vibrations are of a complex nature, since they are affected by local conditions and the nature of the soil. Rock or wet earth are good transmitters of vibrations, while gravel or sand are good sound deadeners. Usually the direction of these is constant, a vertical engine sending out vertical waves and a horizontal engine setting up horizontal ones. The former are hard to prevent as they travel directly down toward the foundation to the sub-soil.

FAN MOTOR INSTALLATIONS THAT MINIMIZE VIBRATION.

Unless special attention is paid to the method of mounting blowers and motors and vibrations set up during operation may be transmitted for considerable distances from the equipment by the air currents or by the frame work of the building in which the apparatus is installed, and this is particularly objectionable in churches or school buildings. Vibrations may also cause sparking at the brushes of motors. Ducts easily telephone throughout their length, and in hotels readily transmit sounds from one room to another by means of the registers in each, something which is not possible in the individual duct system. However, very little trouble, if any, will be experienced from vibration, when the construction,

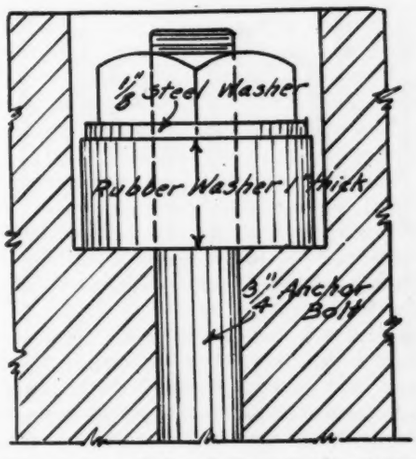

FIG. 25—HOW ANCHOR BOLTS ARE COUNTERSUNK IN FRAMING.

is made as indicated in the accompanying drawings, Figs. 23 to 29 inc.

In Fig. 23 the foundation on which the apparatus is set is made of concrete or brick to provide a firm base. Between this and the base of the machine is placed a resilient sub-base set on 4 in. x 6 in. x 1 in. piano felt pads, placed 3 ft. apart the whole being secured in position by bolts anchored in the foundation and heads countersunk in the sub-base. The sub-base consists of a lower layer of 4 in. x 6 in. or 4 in. x 8 in. spruce or other soft-pine timbers, laid flat and lengthwise of the foundations. Across these, is laid a flooring consisting of 7/8 in. soft-pine boards with two 2-in. layers of hard-

pressed Nonpareil cork separated by one layer of No. 24 galvanized-iron sheets. Around the border of the upper is laid an oil-dressed hardpine coping framed with lap joints.

The size of timbers required for the coping depends on the size of apparatus to be supported. For instance, 3-in. x 8 in. timbers should be used with small-sized fans, such as the steel plate paddle-wheel type with an 80-in. housing. With 90-in. to 120-in fans, 4 in. x 12 in. timbers are advisable, and for larger units, 5 in. x 12 in. timbers are recommended. The size of copings under driving units should correspond to those under fans.

After the coping has been set in place, 1/8-in. sheets of lead should be laid on the surfaces on which the machine base will bear, and the latter bolted to the coping with

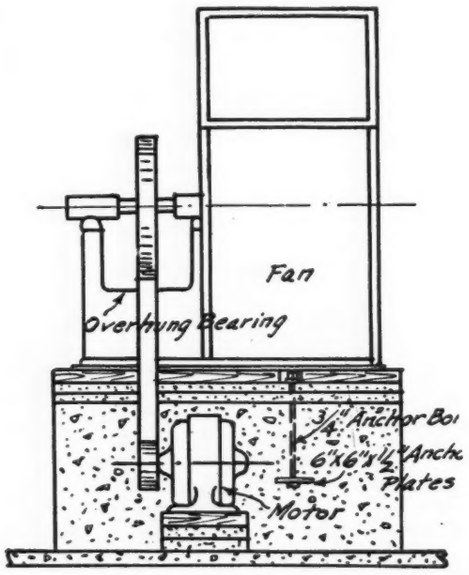

FIG. 26—COMPLETE FAN FOUNDATION FOR NOISELESS OPERATION.

lag screws equipped with rubber bushings, hard rubber washers, and steel washers in the position indicated. With this done, the space over the upper layer of cork between the coping timbers is filled with concrete to within ½ in. of the machine base. This provides extra weight and rigidity without decreasing the resiliency of the sub-base.

It may be pointed out that in the construction which has been described, the aim has been to eliminate all rigid connections between the machine and its foundation, as exemplified by the use of rubber washers and bushings for lag screws, counter-sinking of anchor bolts to avoid contact with the machine base, and the like.

When apparatus is set in basements, propagations of vibration from a machine may be minimized by placing 2 in. of asphalt or sand under and around the masonry foundation. The sand is packed while slightly moist, enough to support the concrete floor, but not to the extent carried through solid be transmitted. Such motion is often carried through solid rock or earth unless building and engine foundations are entirely independent, each of the other. This method will more readily intercept horizontal vibrations than it will vertical ones.

When exhaust fan units are located in the attic, they may have to be supported by a hung platform attached to a wall and overhead girders. In this case, the hanging rods may be provided with springs located between their points of connection to platform and girders, so as to absorb vibrations of the unit and prevent their transmission by way of the overhead girders to adjoining ceilings or thin partitions without air spaces. Sound deadeners as before described, may be used at the fan and motor base, between the platform and building, or at both bearing points of the girder.

Fig. 24 shows a method of framing for fans, overhung pulleys and motors which is not quite as complicated or costly as that shown in Fig 23. The base of the apparatus is bolted to this coping with 1/2-in. lag screws, the coping being 3 in. all around larger than the base of the apparatus and constructed of 3-in x 8-in. dressed and oiled yellow pine having halved joints at the corners. Four 3/4-in. anchor bolts are countersunk, as shown in Fig. 25. Contact of the anchor bolts with the apparatus is avoided by this method, thereby insuring against noise. Under each bolt head a 1/8 in. steel washer is placed and this rests in turn upon a rubber washer 1 in. in thickness. Underneath the coping a further precaution against noise may be taken by installing two layers of Nonpareil hard-pressed cork, 2 in. in thickness. These rest directly upon the concrete foundation into which the anchor bolts are extended and imbedded, together with 6 in. x 6 in. x 1/2 in. anchor plates. A complete installation is shown in Fig. 26.

Another method of sound-proofing fan foundations to prevent telephonic transmission of sound is illustrated in Fig. 27. To accomplish this, it is essential that the fan be isolated from the foundation. It will be noted from the sketch that the metal of the fan and its base are prevented from coming into contact at any point with its foundation or anchorage bolts. Cork is the material used, together with a hard wood coping, bolted in turn to a steel beam or to the concrete of the floor slab.

OTHER METHODS OF DEADENING SOUNDS.

The exact method used for sound insulation will vary with the designer. Alternate layers of lead and hair felt or 1-in. of hair felt compressed between two sheets of lead, or again for smaller fans or motors, rubber washers or coil springs, have all been used with varying degrees of success; though in the case of rubber it deteriorates rapidly. For the usual layout, it is believed that Fig 23 represents modern practice, cork being the best kind of insulation when correctly used and an ideal material since it will show no change in shape after years of service.

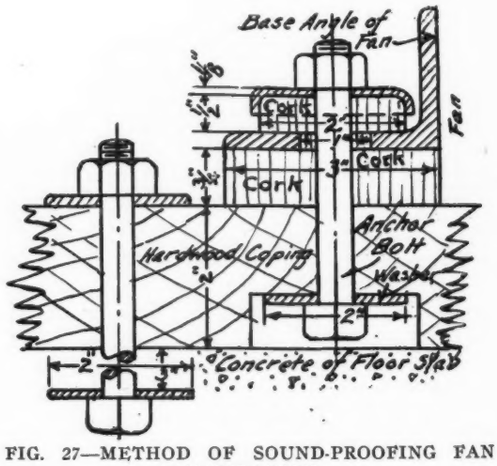

FIG. 27—METHOD OF SOUND-PROOFING FAN FOUNDATION.

In zone instances alternating-current motors must be used to drive fans, in which case two-phase or three-phase units are preferable, since single-phase units, even when equipped to be self-starting, are objectionable, because they usually produce considerable noise due to the pulsating flux, especially in large sizes. Extra precautions should be observed in selecting motors rated at less than 2 H. P. to secure quietly-operating units. When motors have been purchased which do not operate quietly they should be enclosed in sound-proof housings to eliminate primary vibrations, especially when such motors must be installed in the air passage to the blower (see

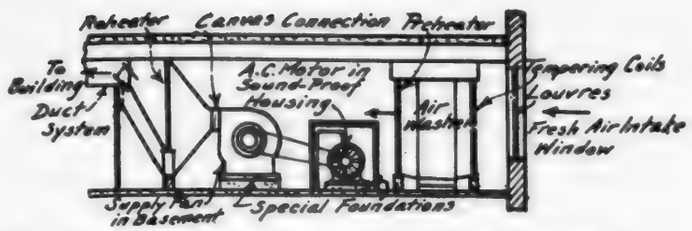

FIG. 28—MOUNTING OF BLOWER APPARATUS, HOUSING OF MOTOR AND CONNECTIONS WITH DUCT SYSTEM TO PREVENT TRANSMISSION OF VIBRATIONS.

Fig. 28). The housing may be constructed with a lining of hair felt held in place with 1/8-in. asbestos sheets, leaving openings for circulation of air. However, this makeshift should be avoided where possible by the selection of suitable apparatus. It should also be borne in mind that belt-driven motors require a sliding base and tightening screws for taking up slack of the belt.

To prevent the transmission of vibrations from fan housing to the duct system, flexible duct couplings may be inserted between the fan and the discharge duct. (See Figs. 28 and 29). These couplings may be constructed of two

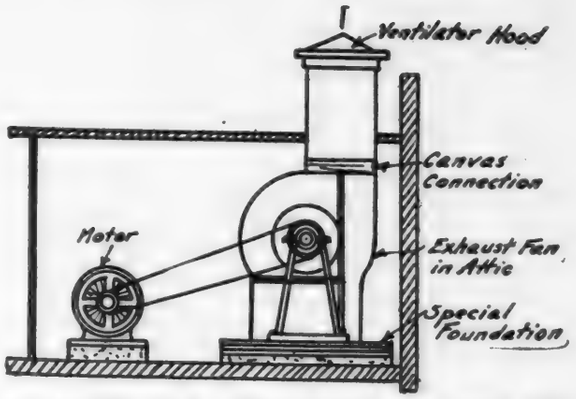

FIG. 29—EXHAUST FAN FOUNDATIONS AND DUCT CONNECTIONS TO ELIMINATE NOISE.

layers of 10-oz. canvas shaped into a sleeve about 8 in. long (depending upon the size of the fan) and fastened to the fan and duct by means of collars bolted to each. Slack should be provided in the sleeves to allow for inflation, and each layer should be painted with four coats of the best lead and oil paint.

TECHNICAL SCHOOL TRAINING FOR THE HEATING PROFESSION

By Professor James D. Hoffman

Technical schools have had but a brief existence, about fifty years, but in that time they have had a marvelous growth and have come to be a supremely important factor in the field of engineering sciences.

The establishment of these schools marks an epoch in the science of engineering in this country. Previous to this time the design of any piece of machinery or structure was largely a matter of chance. Skilled workmen were trained under the old apprenticeship system through years of service to construct and in a limited sense to theoretically design a product, but the engineering of the job from the standpoint of the application of well-understood physical laws, as we now understand them, was absent. It is my opinion that the technical school should receive the major share of credit for his sudden development. If any proof of this statement is necessary we have but to review the events of the last four years to see that the wonderful things actually accomplished were possible only through engineering in its most scientific and refined state. This was a conflict in which engineers matched wits with engineers the world over, resulting in the supremacy of the trained analytical mind capable of independent thought and action. In addition to the professional strength of their graduates the schools gave as leaders in the cause much of their present strength in faculty and students.

I just made the statement that the importance now given to engineering as a world influence should be chiefly credited to the technical school. This should not be interpreted to mean that all the men who have been doing big things in the engineering field have been technical school men. I mean rather, that the technical school for the past thirty years has been the stimulating factor in this country toward engineering development. The world produces many geniuses who do startling things in their own initiative. These men set the pace for others to follow and their works show clearly the need of educational institutions to disseminate their ideas. On the other hand, the experiences of the last five years have shown that the motive force of the world is not the genius (although many of these have received their inspiration within the university atmosphere) but rather the large number of honest, conscientious men who have been taught to do their own thinking and are able to meet emergencies where they exist. That has been, is now and always will have to be the chief aim of the technical school. Four or five years gives just enough time to acquire the fundamentals and the ability to apply these rationally to concrete cases. The technical university, therefore, does not claim to turn out finished engineers. Rather its aim is to give a man a general knowledge of his subject and a working knowledge of his own mind.

GROWTH OF THE TECHNICAL SCHOOL.

Looking back over the last forty years (this is the period of real development) the growth of the technical school has been quite as you would have expected it. Civil engineering, the already existing science, was the first to establish courses, mechanical engineering came second, electrical engineering third and then architectural, chemical, mining and a number of specialized engineering lines in various orders as required by the section of the country in which the school was located. In most of these schools engineering proper has finally developed into four fundamental lines (called variously schools, departments and divisions), namely, civil, mechanical, electrical and chemical engineering, having the fundamental courses of the first and second years common to all, with the specializations in the last two years.

In addition to the four years courses usually given in most schools, a few are offering a fifth and sixth year to allow a broader academic training without sacrificing engineering essentials. Some are establishing fellowships wherein part time research work may be carried on after graduation. Such work can only be done by men having special native qualifications and preparation. Many of the engineering schools are now establishing engineering experiment stations in which the more complex investigations may be carried on under the direction of

* From a paper presented at the annual convention of the National District Heating Association, Chicago, May 26, 1920.

trained specialists. Results from these investigations are usually printed in pamphlet form as monographs and distributed without charge.

THE NEED OF TRAINED MINDS IN FIELD OF HEATING AND VENTILATION.

Any workman is a better workman for having an inteligent knowledge of his subject. Any man who can select the proper-sized twist drill may be able to drill a hole in a casting, but the man who knows how to properly sharpen his drill may be able to double the output. The man who knows the fundamental laws governing the action of steam and water in pipes can run a better line of mains, and so it is in every line of work, the trained mind gives the workman the ability to be more or less independent of his environment. This is especially true in the heating and ventilating business. If the heating of our homes and places of business could be reduced to an absolute formula so that all we had to do were to apply that formula, then a workman could be trained to duplicate one job after another with increasing accuracy, but unfortunately this is not the case.

Every job of heating is different from all other jobs in almost every respect. Standardization is not possible. Two houses equal in size have the same arrangement and floor plans. In corresponding rooms one is found to have casement windows while the other has closely fitted sliding windows. One is floored in the attic, the other is not. In one the workmanship is No. 1, the other is just thrown together. A house on paper is one thing, the realization of this house on its foundation is another thing entirely.

The same is true of the actual installation of the pipes and fittings. One riser requires an offset, a main interferes with a beam, a difficult radiator connection has to be made, and almost innumerable other difficulties arise all of which demand good judgment based upon a thorough knowledge of the subject.

It is probably true that the heating profession calls for the exercise of more good gray matter and real common sense than almost any other line of engineering.

The universities have realized this fact for some time and many of them have offered courses in the subject. These courses, naturally, are restricted to a minimum of time and vary in scope according to the vision of the field held by the professor in charge, but in all cases they deal with the applications of the fundamental laws of physics and thermodynamics to actual practice.

THEORETICAL AND PRACTICAL MUST BE BALANCED.

The courses in many schools have been largely theoretical because of the lack of time and facilities for practical work. This, in a sense, tends to develop a one-sided man, but in schools this is a commendable development. It would be well if a large amount of actual practical experience could be had at the same time, but in most cases this is not possible. On the other hand, the tendency of the trade is away from the theoretical and toward the empirical. As a result the average is good. This is as you may expect it to be. By the natural laws of mind development the young man is able to cultivate deeply analytical mental processes that would be wholly impossible to the average mature mind. For this reason, together with the fact that the professional and business man usually takes the empirical or short-cut method in doing his daily tasks, there should be great stress laid upon the cultivation of analytical methods while in school. Many times problems are given to the student to solve by exhaustive processes, when other and shorter methods are available, not so much for the final results as to serve as mental gymnastics and cultivate the ability to think for himself. I am aware of the fact that the schools are severely criticised at times because their graduates lack that practical touch so necessary to the practicing engineer. Some schools are meeting this situation by permitting a greater degree of specialization. For example, those intending to follow heating and ventilating work will be given a greater amount of drawing-room time for the designs, and laboratory and commercial tests to check their theoretical studies. Necessarily, such an arrangement produces a higher decree of efficiency in the one line at the expense of other subjects which might be taken. This is a big question which is yet unsolved by educators namely, which man is any firms best asset, the one thoroughly grounded in the fundamentals with a fair amount of specialization, or the one only fairly well grounded in the fundamentals with much specialization. Personally, I am firmly convinced that the former is the better plan. The highly specialized man would get into the thick of things more quickly and for a few years would lead in the race, but observations show that the conditions soon reverse.

FUNDAMENTALS FOR HEATING AND VENTILATING.

You may be interested to know what fundamentals may be considered a requisite for a good course for an embryonic heating and ventilating engineer. The *first* I would suggest relates to his development as a man among men. He should have a good command of the English language and should be able to write and discuss upon any subject in a logical and persuasive way. This is usually slighted by the young engineer as applying to the other fellow but not especially to him.

One of our greatest problems in teaching these men is to convince them that to rise to the top of their chosen profession they *must* pay attention to rhetoric, English composition and oral discussion. Many of our graduates in all lines of work have testified to their lack of this one essential in their early training.

Second, they must be fundamentally grounded in theoretical and applied mathematics. This is a tool which will curve any figure known to science, if the owner knows how to use it.

Third, physics or the study of the laws of matter.

Fourth, thermodynamics or the laws of heat energy.

Fifth, the application and development of these fundamental laws into constructive practical problems.

The last is the trade specialization and in this case is called *heating* and *ventilation.* The courses preceding and leading up to this subject need not necessarily be specialized in favor of heating and ventilating problems. In fact it will tend toward more independence of thought if this is not done. Any physical law in any subject to be well understood and to be of the greatest value to any man must be presented in applications as varied as possible to acquaint the student with its possibilities.

The subject of heating and ventilation is a specialization, although in itself it is sufficiently broad to satisfy the most exacting. For example, in the study of ventilation, questions of air conditioning in its relation to health, involving a knowledge of physiology and hygiene, present lines of thought that can not be satisfactorily analyzed by any of the fundamental courses mentioned. Here are questions that call for re-search work of a special character and different from that previously attempted by the profession. Unfortunately what we don't know about this phrase of the subject at this time would fill many volumes. Suffice it to say that our treatment of these topics should be sane, logical and without hysteria or radicalism.

Also in the study of chimneys, and furnace and fan-coil heating there are problems in air warming and air movement by convection and power devices that are as complex as we wish to make them. Also in water and steam isolated and district heating plants there are problems in heat generation

and transmission that call for the most thorough theoretical training in physics and thermodynamics. And so on the list might be extended almost indefinitely.

Until a few years ago heating problems were satisfactorily solved, when they were developed along the lines of the best average practice without regard to whether the best average practice could be improved or not. Heating engineers' conventions had few analytical presentations, probably because their value was not fully appreciated. Now they have so much valuable literature on the subject that it is found worth while to issue society journals to circulate the facts to the members. The sections of the technical press devoted to heating were largely descriptive in character, now we have periodicals wholly devoted to the subject and filled with the most up-to-the-minute analytical presentations. In a short time the conditions have wholly changed. We are now looking for rational analyses, not for a few, but for practically all of our problems. Where a few years ago the heating profession was purely a business proposition, it is now fast becoming a science. It is coming into its own and the technical school has had no little share in bringing this change about.

WHAT THE SCHOOLS ARE DOING.

For my own satisfaction and for your information I am endeavoring to summarize the courses in heating and ventilation in the various technical schools of the country and give you an idea of what is being done. Questionnaires were sent to 57 institutions. Replies have been received from 75% of these. Of the 43 replies received, 34 report courses in heating and ventilating and 9 report no courses. Of the 14 schools from whom no replies were received I have reason to believe that 6 have courses. Of the 34 courses reported 6 are elective and 28 are required. Of the 34 schools the hours allowed for any one school are:

Maximum

Recitation and lecture.....72
Laboratory and drawing.....107
Outside work.....some

This does not include one school which we will call A, which gives options in each of the four years, totalling respectively 144, 324 and 312 hourse.

Minimum

Recitation and lecture.....9
Laboratory and drawing.....0
Outside work.....0

Average for Schools

Recreation and lecture (34 schools including School A).....36 hours
Laboratory and drawing (25 schools including School A).....51 hours
Outside work (10 schools including School A).....81 hours

Courses including

Ventilation 30
Furnace heating.....31
Steam and water heating.....33
Fan Coil heating.....30
Central station heating.....25
Electric heating.....13

Central station heating, one of the more recent systems to be developed and one of the most localized in character is represented in 74% of the courses reported.

THE FUTURE OF THE WORK

The field of heating and ventilation, with all its present cultivation, is as yet but superficially touched by experimental re-search. For a number of years engineers have been developing more consistent and workable theories but these theories were more or less speculative without actual experimental data to check them. In the general progress of the art the time has come to confirm or change our theories and in response to this appeal the re-search laboratories of the country are being offered and their energies co-ordinated so as to reach all parts of the field. I feel called upon to express my gratification at the spirit of co-operation existing among all forces available. All seem determined that the greatest amount of public satisfaction and good may be obtained from the least expenditure of national resources. In this work the universities have done good service and are now planning closer co-operative effort that there may be the broadest scope to the work with the least amount of duplication.

It is a very significant fact that 25 out of 34 courses contain more or less instruction in central station heating. District heating, along with all other public service corporation, has been up against serious conditions the last few years. The shortage of fuel and supplies, and the uncertain labor market have not only curtailed but, in many cases, actually put out of business industries that should have been maintained. This is an unfortunate state of affairs, but we confidently believe that with the gradual settlement of our flood of economic difficulties following the war, district heating problems will also be solved satisfactorily. Some of these problems are administrative and the schools can serve but indirectly, but in those technical production and service problems that lend themselves to experimental and theoretical analysis they are going to assist to the limit of their ability. I wish to close re-affirming my faith in the future of district heating and an assurance of such assistance as it is possible for me to give.

ADVANTAGES AND DISADVANTAGES OF STEAM AND WATER HEATING

By R. V. Stureman

It would probably be best to consider separately heating from a central station and from an isolated plant located in the individual building. By central station heating we will mean heat furnished or served to a building or groups of buildings from an outside source.

We may name a widely deversified list of industries that can be heated from an outside source and that may be heated with steam or hot water. Among the most prominent of which are; cities or sections of cities, industrial groups, educational groups, hospital groups and government building groups.

CENTRAL STATION HEATING BY COMMERCIAL COMPANY.

Let us first consider sections of cities with heat furnished by a company on a commercial basis. Starting with the plant in our comparison we must segregate between a combined electrical generating and heating plant and a strictly heating plant. In the case of the combined plant hot water will give an increase of efficiency and also an increase of capacity of the generating units due to exhausting into condenser heaters and operating at a vacuum instead of a back-pressure, as with steam.

With hot water all the condensation is retained which may be re-used in the boilers, reducing the operating costs and eliminating to a large extent the necessity of water-softening in those cases where the water is of such a nature as to make it undesirable for boiler use. This is not possible with steam, unless a two-pipe distribution system is installed returning the condensation to the plant, which is not considered practicable on account of the high cost of installation.

The steam has this advantage in that no circulating pumps and heaters are required which thereby reduces the initial cost of installation and expense of maintaining this equipment.

There are a great many advantages with steam over hot water in its distribution, the principal one being that steam may be accurately and easily metered, allowing its sale on this basis and entirely eliminating the necessity of a flat rate which at the present time is necessary with hot water. However, even though a steam distribution system is installed and the customer desires water heat in his building a steam converter may be used and its condensation metered. Meter rate permits, as you all know, of having a sliding scale which automatically gives the larger customer the opportunity of earning a lower rate; this is not feasible with the flat rate. It is needless to mention the numerous advantages of selling or purchasing heat on a meter-rate basis over the flat-rate system, but the advantages in its favor alone would warrant the installation of a steam heating system over a water heating system.

With the steam distribution system it is possible to secure a class of business, such as the heating of water tanks and cooking equipment which service cannot be furnished satisfactorily with hot water.

The capacity of the steam system may be greatly increased above the initial design by carrying a higher pressure, the ultimate capacity being fixed only by the limitations of the back pressure on the generating units. The ultimate capacity of the water heating system is fixed within the narrow limits of initial design and, even though it is possible to increase the operating pressures and temperatures slightly, the capacity cannot be increased in the same ratio as the steam.

It has been demonstrated by a recent valuation of a steam and water heating system in the same city that the steam system can be installed at a less cost per square foot of equivalent required direct steam radiation than the water heating system. In the valuation referred to, the cost of the steam was 94 cents per square foot and the hot water, $1.20 per square foot. In this case the type of construction of the steam system was much better than the hot water system and if the same type had been used with hot water as with the steam its cost would have been considerably higher, making the difference that much greater.

With hot water there is a great danger of damage to the building and contents due to leakage and breaks, which damage would be very serious on account of the volume of water in the system and being generally under a considerable pressure. On account of the pressure required hot water is not considered practicable for business sections where high buildings must be served. The static pressure in the system increases, of course, with the height of the building while steam will circulate to the top floor of almost any building at a few ounces pressure. It is the opinion of some engineers, however, that hot water is more desirable than steam in residence districts.

The flexibility with which steam may be operated gives it a great advantage over hot water. The customer can maintain different temperatures in various rooms, which eliminates the opening of doors and windows. During certain periods of the season the customer may shut off the service from the entire building and re-heat it in a much shorter time than with hot water, thus giving a maximum of regulation and reducing the cost of heating to a minimum.

It is well known that with the common type of water radiator valve the circulation of the water in the radiator cannot be entirely shut off, thus making it impossible to completely cool the radiator. By the use of steam valves on water radiators this is possible. However, there is then a great danger through oversight or neglect, of the water freezing and bursting the radiator, causing possible damage.

CENTRAL STATION HEATING FOR GROUPS OF BUILDINGS.

In the case of a central station supplying heat to a group of buildings of any of the following classes: Industrial, educational, hospital, or government, there is some question as to the advantage in the use of steam or hot water.

If ventilation, air conditioning or cooking is required steam is absolutely essential. If these conditions do not exist and the plant is a combined electric and heating plant there would be an increase of efficiency in the generating units with water heating.

Hot water has a further advantage in that the building temperatures may be controlled from the source of supply rather than from each individual building. This is assuming that all the buildings in the group are to be heated to the same temperature. If it is desired to maintain different temperatures in the various buildings there would be a decided advantage in the steam service.

Although it is possible with the water heating system during certain periods of the year to lower the temperature of the circulating water, this economy might be more than offset by the opening and closing of doors and windows, due to the inability to shut off radiators.

In case of the steam, while it is necessary to carry a fixed pressure on the distributing mains throughout the season, with the aid of the modern vapor system it would be possible to obtain any temperature desired in the individual rooms without opening doors and windows.

In the case of feeble-minded institutions and possibly hospitals hot water might have an average on account of the danger of injury from burning with the steam radiators.

HEATING OF LARGE INDIVIDUAL BUILDINGS.

In the heating of large individual buildings, such as the Grand Central Station of New York and the proposed Union Station of Chicago, the writer is at a loss to see any advantage with water heating, with the exception of increased efficiency with the combined electric and heating plant.

It would appear that there would be many advantages in the use of steam, such as more rapid circulation, greater flexibility, and ease of regulation, smaller units, and the elimination of the greater possibility of damage due to leakage and breaks.

RESIDENCE HEATING.

In the past it has been generally recognized that water heating in a residence with a boiler was more satisfactory than with steam due to the fact that with the old type of steam system it was necessary to carry from 5 to 25 lbs. pressure which made it difficult with bituminous coal to maintain a uniform pressure without frequent firing periods.

The development of the modern vapor steam system and damper regulating devices have eliminated those objections to such an extent that it has become as simple in operation and just as desirable as hot water.

Hot water has the advantage that the temperature of the circulating water can be regulated at the boiler. The steam, however, has its advantage in quicker circulation and the ability of carrying various temperatures in the individual rooms. Steam also permits the use of smaller radiator units which is a decided advantage in a residence.

In concluding this paper it is a simple fact that both steam and hot water have distinct characteristics that should entitle each of them to the fullest consideration.

NATIONAL DISTRICT HEATING ASSOCIATION

ELEVENTH ANNUAL CONVENTION HELD AS INDUSTRY FACES CRITICAL PROBLEMS OF THE DAY

A SPIRIT of dogged determination to "carry on" through the critical period now facing the central station heating industry was strikingly manifested at the annual convention of the National District Heating Association which was held in Chicago, May 25-27. In spite of the fact that many of the committee members, as well as the officers themselves, have had their hands more than full during the past year in meeting the problems resulting from rising fuel costs, irregular transportation, inadequate heating rates and labor troubles, they found opportunity, nevertheless, to get together interesting data on the various phases of district heating design and operation and their reports, together with the scheduled papers filled all of the available time of the three-day session.

The situation in the district heating field was, perhaps, best expressed by Secretary D. L. Gaskill who stated in his report:

"It was expected at the time of the annual convention of last year that utility companies had reached the pinnacle of high cost in operation. It is with regret that we take notice of the fact that we are now facing a higher cost than existed a year ago on account of the unprecedented advances in the cost of labor and fuel, and it is also a fact that the coming year will probably be the most expensive year in operating costs that we have ever encountered in our history."

Morning Session, May 25.

The convention opened at the La Salle Hotel, where the seventeenth floor had been reserved for the association's use. A warm welcome was given President J. C. Hobbs upon his return to business activity after his long illness which compelled him to relinquish his duties as president, as well as manager of the heating department of the Duquesne Light Company, Pittsburgh, during most of the past year, and seek rest and recuperation in the Adirondacks. After calling the meeting to order, President Hobbs took up the first item on the program, which was the report of Secretary-Treasurer D. L. Gaskill.

SECRETARY-TREASURER'S REPORT.

Secretary-Treasurer Gaskill reported a comfortable balance on hand of $336.15. The present membership is 302, a falling off of 23 members from last year's total.

Mr. Gaskill then presented a general review of the condition of the industry and of the association. After mentioning the high and still rising operating costs, he continued:

"Every utility man is turning to the public seeking for a way in which the extraordinary costs of the present time may be met. There is but one way to meet them and that is a substantial increase in rates for service to cover the extraordinary costs we are now encountering in the operation of business. Where rates have not been adjusted to meet these new burdens, utility managers should lose no time in obtaining from their proper governmental body the right to increase their rates for service to cover the tremendous costs with which we are now confronted.

"The condition of transportation at this time is deplorable, and it is announced by good authority in railroad operation that we may expect by September first, the greatest strike ever known in railroad history. This means that there will be almost a total cessation of transportation and it is possible that it may extend to the transportation of fuel and if so, it is highly important that every utility man provide as great storage as possible in advance of this catastrophe. It is well to remember that in the heating business, heat is absolutely necessary to the preservation of the health of the people and no effort should be spared to provide sufficient coal storage as will enable companies to keep in operation throughout the period.

"The labor situation will probably grow worse as the wage advances. There will be no change in that particular for the better until industry slows down and it becomes necessary for Labor to realize that service is a part of its duty. The country today is suffering more from lack of service on the part of Labor than it is from lack of equipment or lack of money. No reasonable man can complain of the price being paid for labor but every employer is bound to complain of the service that Labor is giving for the money it receives. There seems to have been a propaganda which has taken deep root that by limiting the amount of labor performed it will create a greater prosperity for those who labor. This fallacy is fair to continue until Labor will realize that there is no return in the way of wages unless there be adequate return given for such wages. There is no question but what there is need of a great campaign of education in this direction. Labor unions and other bodies who are against the prosperity of the country have been active in spreading propaganda of an opposite sort and it is time for those whose business is jeopardized for the lack of such service to begin a propaganda in the other direction. Men who employ labor are not complaining so much as to what they are paying as they are for the service they are receiving."

Mr. Gaskill referred to the publication of the heating rates of many of the heating companies in the association's Bulletin and stated that there was a wide-spread demand for these rates. While rates, he added, "should never be based upon what others are charging differently located and in different communities, it is idle to say that those engaged in the same line of utility work are not interested in what others are receiving for like service. Cost of fuel and the amount of investment must always determine what utility rates should be, but with the rate sheets of other companies as a guide, the heating man can intelligently make up his own rates based on his own costs and investments."

On the subject of the association's proposed "Handbook of Central Heating Data," Secretary Gaskill stated that this matter was rapidly being put into shape for the printer and it will probably be issued in the Fall.

President Hobb's address took the form of a discussion of "Operating Problems," in which he dwelt at length on important phases of central station operation.

He appointed as the nominating committee, G. W. Martin, New York, chairman; H. R. Wetherell, Peoria, Ill.; and F. R. Heath, New York. The auditing committee was made up of J. H. Walker, Detroit, Chairman; G. W. Martin, New York; and E. L. Wilder, Rochester, N. Y.

Afternoon Session, May 25.

The principal speaker at the afternoon session was Dr. E. V. Hill, president of the American Society of Heating and Ventilating Engineers. Dr. Hill's subject was smoke

prevention. He created a flurry by suggesting that the City of Chicago form a company to be municipally owned, for the purpose of extracting the by-products from coal. The residue left after this process, a semi-coke, he said, could be sold to Chicago industries and consumers for heating purposes. It was claimed that the smoke nuisance would thereby be greatly relieved.

The suggestion was also made by Dr. Hill that block-heat companies should be formed to supply heat to all buildings in a particular block. Greater efficiency, he stated, would result in that it would be possible to effect economies in the operation of such plants over that of one large plant. Additional advantages accruing in favor of block heating systems would be that streets would not have to be torn up and the large investment costs of a large underground distribution system would not be required.

Following the address of Dr. Hill, the report of the Heating Research Committee was presented by James A. Donnelly, chairman. The report was confined to a statement of the progress of research in the heating field.

The following investigations, he reported, are now under way or soon will be:

(Those marked with an asterisk are now in progress.)
University of Minnesota.
* Radiation losses from radiators.
Heat losses from building materials.
Effect of humidity and temperature on the human system.
University of Illinois.
* Warm-air furnace tests.
* Measurement of air flow at low velocities.
* Determination of critical velocities in steam risers and laterals.
Tests of vacuum traps.
University of Michigan.
* Heat losses from pipes in the ground.
* Determination of flow in gravity water heating systems.
Conductivity of building materials.
Penn State College.
* Heat losses through building materials.
New York University.
Pipe sizes.
Friction of flow in vacuum return lines.
Vacuum pump capacities.
Yale University.
* Tests of direct radiators.
Tests of vacuum valves.
Kentucky State University.
Fractional valve capacities, (Size of orifice at standard pressure).
Johns Hopkins University.
Tests of special types of radiators (steam and water-types).
Tests of gas-fired radiators.
Tests of electrically-heated radiators.
University of Wisconsin.
Heat losses through pipe coverings.

Mr. Donnelly in his report also suggested the following lines of research in steam and return pipe problems:

Laboratory:
1. Up-feed steam risers.
   (a) Critical velocities at which down flow of condensation is balanced by up-flow of steam (1) center of pipe; (2) side of pipe.
2. One-pipe steam risers.
   (a) Friction of flow of steam.
   (b) Pressure reduction due to friction of down-flow of condensation.
3. One-pipe steam radiator connections.
   (a) Determination of influence of size of pipe on (1) length of radiator, (2) length of connection, (3) number of elbows, and (4) pitch of pipe.
4. Steam pipe drips.
   (a) Minimum velocity of steam which will lift condensation from pockets in fittings, rendering dripping useless.
5. Return piping.
   (a) Capacities of pipes for lifting condensation by vacuum.

Field Research.
1. Steam and return mains.
   (a) Friction drop in both vacuum and gravity systems.
   (b) Influence of entrained water and condensation.
2. Vacuum pump discharge pipe.
   (a) Friction of flow of water and air.
3. Determination of amount of direct radiation installed, as ascertained by hourly meter readings in coldest weather.

In the discussion of the report J. H. Walker offered the suggestion that the committee should serve as a point of contact between the association and the Research Bureau of the heating engineers' society. In discussing the matter of load peaks he pointed out that three elements are responsible for the peak loads which occur when steam is first turned on a building: 1, the steam required to fill the radiator; 2, the steam required to heat the radiator and connected piping, and 3, the steam required to supply the heat given off by the radiator. H. R. Wetherell stated that the difficulty of condensation passing by drip points in underground mains could be overcome if the practice was followed of dripping the lines at corners where a change in direction was made. In the dripping of "services," he said that it was formerly his company's custom to make the drip from the bottom run of a tee connected bull-headed into the service main. Only a small amount of condensation was trapped with this method of connection, but it was found to be a greatly increased amount when the service main was connected to the run of the tee. In this method of dripping the vertical rise into the building would be made from the bull-head of the tee and the drip would be made from the end of a pipe approximately 18 in. in length that was connected to the run of the tee and was the full size of the service main.

As an illustration of the carrying power of steam at medium and even low velocities, he stated that at one of the plants with which he is connected, they recently lost a blading of one of their turbines. Some time later their trouble man was called to a building where a reducing valve was not functioning properly. Upon taking the valve apart a number of the turbine blades were found and before the trouble was remedied a small basket of turbine blades had been removed. These blades had travelled eight blocks up grade and had passed up for a distance of 10 ft. through a 4-in. service line and through a service valve before finally lodging in the reducing valve.

President Hobbs suggested that research along the line of determining the corrosion of return lines and the field for welded piping be done by the member companies of the association.

In closing the discussion, Mr. Donnelly stated that aside from the diversity factor, the initial peak would depend upon the element of time required to bring up the building to the required temperature.

NEW OFFICERS.

The nominating committee presented the following ticket which was unanimously elected at a later session:
President, J. L. Hecht, Chicago.
First vice-president, J. H. Walker, Detroit, Mich.
Second vice-president, E. L. Wilder, Rochester, N. Y.
Third vice-president, W. G. Carlton, New York.
Secretary-treasurer, D. L. Gaskill, Greenville, O.
Executive committee: J. C. Hobbs, Pittsburgh; Fred B. Orr, Chicago; and F. A. Tucker, Danville, Ill.

Morning Session, May 26.

Steam meters and accessories were discussed at the Wednesday morning session, this subject being presented by R. C. March, chairman of the Committee on Meters and Accessories. The report stated that meters as an essential factor in the distribution of central station service have acquired a more secure place than ever before as a necessary feature of the equipment. This is illustrated by the fact that during the past year several more plants changed over from a flat rate to a meter basis.

No material changes or improvements have been made during the past year. A statement that the committee had refrained from making a compilation of difficulties experienced by a number of central station operators with different types of meters brought forth the comment that this policy was hardly in the interest of progress and that an engineering association could ill afford to be influenced by considerations of the feelings of the manufacturers in the matter.

DEVELOPMENT OF HOT WATER METER.

Last year, continued the report, it was suggested that by this time the committee would be able to present something definite as to the development of a practical hot water meter. Such a meter was made up and proved to have merit in both the composition and design of its rotating element, but the manner of supporting the bearings was not good and the meter soon became noisy. This phase is now undergoing revision, but under stress of present conditions the manufacturing force is put to it to get out their standard product so that the committee has been unable to secure much progress on new development. The metering of hot water by the meter already developed assumes the temperature of the flow and return water at the station as that upon which the B. T. U. demand by all radiation shall be calculated. For the purpose of rate making, this may be compensated for as follows:

The quantity necessary to circulate through an average house is about 0.4 gal. per square foot of radiation per hour, but if the house is especially well built the full flow will be required a less number of hours, when both are controlled by thermostats. Of course, the ideal instrument would include a recording thermometer in both flow and return pipe, but this refinement is hardly worth the expense incident to maintenance, inspection and changing the charts.

The committee's experiments with this and with a standard disc water meter, having a special disc, showed that the resistance through the meter was sufficient to seriously affect the circulation in the service where the differential in pressure is less than 3 lbs. As the differential at many points, independent of the use of circulation discs in the pipe, is less than 3 lbs., it follows that considerable expense would be necessary in the way of enlarging the meter.

It was brought out in the discussion that the Pitot tube is rapidly being discarded in the district heating field for measuring steam flow, its place being taken by the disc orifice plate and flow nozzle. The Pitot tube, it was stated, was found to be inaccurate on low velocities and has a tendency to become clogged with scale.

In the selection of steam meters it is important to first learn the condition under which the meters are to operate. Their accuracy, it was stated, can be guaranteed only from one-third to maximum capacity.

The discussion of this report was followed by an important address by Professor J. D. Hoffman, of Purdue University, on "Technical School Training for the Heating Profession."

(Professor Hoffman's address, substantially in full, is published on another page of this issue.)

At the conclusion of Professor Hoffman's address, Secretary Gaskill put in a stirring plea for more adequate salaries for college professors and called attention to the discrepancy between the increase in their remuneration as compared with the increased living costs.

Referring to the importance to an engineer of being able to express himself clearly and forcefully, President Hobbs said this part of an engineer's training could be likened to the selling department of a manufacturing concern. Everyone is a salesman and in the case of an engineer, his ability to sell his services depends greatly upon his training as a speaker and writer.

The morning session concluded with the description of a high-pressure steam main of unusual requirements constructed during the past winter, which involved considerable changes from accustomed procedure. The installation was made by the American District Steam Company and was described by H. C. Kimbrough, secretary of the company.

Unusual Installation of High-Pressure Underground Steam Main.

By H. C. KIMBROUGH, Secretary, American District Steam Company.

The line was built for the Erie Lighting Co., Erie, Pa. to serve high-pressure steam to move generators located in the Peach Street power station of the company. This station is 1600 ft. away from the company's new Front Street station which was built by Day & Zimmerman in 1917 and has installed therein 20,000 K. W. G. E. generators.

From the Peach Street power plant, which is the original plant of the Erie Lighting Company, there was constructed,

WELDING JOINTS OF 12-IN. HIGH PRESSURE MAIN, ERIE LIGHTING COMPANY.

Tunnel lining and reinforcing in place, but base only poured.

a number of years ago, a low-pressure heating system which served the business district of that city.

The economies of the new or Front Street station were so marked, so far as the boiler room was concerned, that the management conceived the idea of making all steam required for the entire K. W. demand of both the Peach Street station and the Front Street station into one boiler plant at Front Street.

The electrical apparatus at the Peach Street station was designed specially for underground heating so that that plant served best the purpose of steam distribution through the system of underground mains and after considerable conference and preliminary designing there was perfected an underground high pressure, 12-in. main.

Ground was broken in October, 1919, and construction began on specifications which had been approved by various engineers of a 12-in. underground line having a requirement

of maximum operating pressure of 250 lbs. per square inch, superheat of 225° F. and delivery requirement of 250,000 lbs. of steam per hour. The steam temperature in the line, under test is shown varying from 550° to 700°.

This main is installed along the lake front, a portion of it being below lake level. A large amount of water was encountered during the excavation making tight sheeting absolutely necessary. In order to relieve water pressure from the exterior of the completed conduits a sub-soil of coarse

DUPLEX SLEEVE EXPANSION JOINT WITH TEST CLAMP ATTACHED, MADE NECESSARY BY ABSENCE OF FLANGE ON SLIP END OF JOINT.

stone and gravel 18 in. in depth was laid, drained by tile lines to a sump. This was placed in the bottom of the trench and upon this foundation a concrete base of conduit (multi-cell) was constructed. The sump is automatically pumped as the water accumulates. The conduit is constructed of a hard-burned hollow tile resting on concrete base. The tile was specially manufactured for the purpose and laid in cement mortar. To prevent water from entering the conduit a membranous water-proofing was used so applied that the conduit was thoroughly sealed by two layers of water-proofing felt and one layer of burlap which is hot-mopped with pitch. To prevent the weight of the conduit from

ALIGNMENT GUIDE IN POSITION WITH COVERING FREE TO TRAVEL THROUGH GUIDE WITH MOVEMENT OF PIPE IN EXPANSION.

Covering is applied in sectional blocks held in place by banding. Later all crevices are filled with Nonpareil cement before applying water-proofing to covering.

puncturing the membrane the concrete base is made of two sections, an upper and lower and the membrane passed between the two. The portions of concrete work which is below the lake level is surrounded by a concrete envelope 5 in. thick, the purpose of which is primarily to protect the water-proofing. Nonpareil covering was used and this was applied in blocks two layers thick held in place by wire, all crevices being filled with nonpareil cement.

Water-proofing of this covering was accomplished by applying two layers of high-grade roofing paper, each layer mopped in place with high-temperature asphalt varnish and all joints were broken. As an additional insulation the interior of the conduit above the center line of the steam main also the voids in the multi-cell tile were packed with dry nonpareil.

The steam pipe is extra-heavy strictly wrought-iron line pipe and the joints were made by electric arc welding. There are no thread connections in the main and the number of flanged joints are reduced to the minimum, such joints being necessary only at expansion joints and elbows. All flanges are extra-heavy cast-steel of the Hughes pattern.

The expansion of the main pipe line is taken care of by the use of 13 extra-heavy cast-steel duplex sleeve expansion

MULTICELL CONDUIT WITH MEMBRANOUS WATERPROOFING COMPLETED.

Rounded edges of conduit caused by bending thick membrane around corners.

joints and built to take care of a maximum of 8 in. of traverse. The expansion joints are anchored to the concrete wall of the manhole by a specially designed steel anchor wing. The unique feature of the patented expansion joint which was required for such extreme conditions is that the slip for moving alignment consists of an inner and outer sleeve of forged steel treated with a rust-proof process and highly polished. There is a ⅜-in. air space between these two sleeves, the object of this construction of slip joint being to prevent the packing coming in contact with a high temperature (approximately 700° F.) to which the inner sleeve is necessarily subjected. With a temperature reduction of approximately 40° on the outer side of the outer slip the life of the packing is indefinitely increased.

Flanges were eliminated from the movable ends of the expansion joints, the inner sleeve being welded direct to the pipe line.

It has been the experience of engineers who have had opportunity to observe high-pressure mains in operation that the expansion variation creates a weave in travel, thus dis-

torting alignment which creates packing and gasket troubles in the usually constructed high-pressure lines. To eliminate this condition there were placed at average intervals of 30 ft. specially-designed alignment guides. These guides consisted of a semi-steel shell bolted to the concrete base by means of previously set anchor bolts. Attached to the pipe and moving freely through the shell of the guide with proper clearance are semi-steel clamps supporting the pipe concentrically in the guide by means of four points or lugs.

COMPLETED SECTION OF WATERPROOFED COVERING WITH SECOND LAYER OF WATERPROOFING APPLIED.

Note high gloss of asphalt varnish. also Hughes flange on heavy end of Barnes expansion joint.

At intervals of approximately 10 ft. saddle plates, rollers and chairs are placed beneath the main as additional support and assistance in the free movement of pipe to take care of expansion, etc.

MULTICELL CONDUIT WITH TOP TILE IN PLACE.

Concrete anchors of alignment guides projecting through at regular intervals.

Due to conditions underground which were encountered, the steam main took a devious path requiring the angles which were cared for by the use of pipe bends and extra-heavy cast-steel sweep elbows with large anchor bases which were specially designed for this work. These bases are anchored in concrete foundations and all anchors are thoroughly backed up by concrete abutments.

From the standpoint of the Erie Lighting Company the net saving in labor due to the closing of the boiler room in Peach Street approximated thirty men. The saving in fuel, of course, is considerable inasmuch as it was possible to shut down an entire boiler plant consisting of 6 boilers aggregating 3550 H. P. doing the same amount of work from one boiler plant and only increasing the boiler capacity in operation at the Front Street station by putting in 1700 H. P. additional boiler. This line was put in operation in February, 1920, having taken practically the winter months which were most severe for the construction work.

The line, under these severe requirements, both of pressure and superheat, has thus far given not one moment's trouble nor has there been any expense whatever by way of attention to packing of joints or any other incidental upkeep, as we are informed. Perhaps the conditions calling for this

"CLOSE UP" OF MULTICELL CONDUIT, SHOWING FILLING OF SIDE TILE AND TOP OF CONDUIT WITH DRY NONPAREIL.

"Trough" at each side designed to prevent dry filler from finding its way to concrete base beneath.

installation were unique, but the fact remains that the problem of conducting steam at a high pressure and with superheat has been a difficult one to handle and it is hoped that this recital will be informing.

In the discussion E. L. Wilder told of an interesting expedient adopted in Rochester for welding the bottom of pipe joints. The difficulty of performing this work in the cramped quarters of the conduit were overcome by cutting a window in the pipe itself and later welding the piece back again on the pipe.

Afternoon Session, May 26.

Although the Station Operating Committee reported that it had been unable to carry out the rather ambitious program which had been laid out, the committee's report, never-

theless, contained an unusual amount of material compiled from the work of others. A number of special tests and experiments planned by the committee had to be abandoned due to the slowness of manufacturers to respond and the seriousness of the coal situation. The report was presented by Fred B. Orr, chairman, and included:

"Comparison of Direct, Indirect and Combination Water Central Heating Systems," by J. M. Strike, superintendent of production of the Toledo Railways & Light Company, describing the various methods used by that company in heating the water in its heating systems.

"Daily Unit Data and Cost System as Applied to Central Station Management," submitted by J. M. Strike. This system comprises eleven forms or sheets and, it was stated, had been used with great success in providing an easy method of balancing the day' work in the power plant.

"Performance of Coxe Stoker Using Western Coals."

"Disposal of Soot from Steam Boiler Furnaces," by C. L. Davidson, New York, in which a method was described of ejecting the soot accumulation by steam back into the fire, instead of passing it up through the stack to the surrounding neighborhood.

"Concentration in Boiler Feed-Water," by F. F. Vater, which explained in plain language the reasons for purifying boiler feed-water and a discussion of the various processes in use for accomplishing such purification, as well as means for softening make-up water.

A paper was presented at this session, illustrated by lantern slides of "General Electric Extraction-Type Turbines," by C. C. Douglas, of the General Electric Company. Mr. Douglas went at length into the construction and operation features of this apparatus, showing its use in connection with supplying low-pressure steam for heating purposes, and explained in detail the characteristics of the machine under given conditions.

Morning Session, May 27.

Director John R. Allen of the heating engineers' Research Laboratory in Pittsburgh was the first speaker at the Thursday morning session, Director Allen presented a paper on "Heat Losses from Underground Pipes," which was also presented at the heating engineers' meeting in St. Louis the previous day.

PROGRESS ON THE ASSOCIATION'S HANDBOOK.

The next report, that of the Educational Committee, concerned the association's proposed Handbook. J. H. Walker, chairman of this committee, stated, by way of preface, that it was not the intention of the committee that the Handbook should take the place of the standard mechanical engineers' handbooks and, therefore would not contain many data of a standard nature which could be found in the general handbooks.

In the compilation of the data to be included in the Handbook, he said the subject matter has been divided into five different headings consisting of:

1. Underground construction.
2. Meters.
3. Accessory apparatus.
4. Building requirements.
5. Material on water heating.

Each of these divisions has been placed in charge of one member who is responsible for the compilation of the data in his particular division. Such excellent progress is being made in the assembling of all of this information and data that it is confidently predicted that the Handbook will be a reality before the next annual meeting of the association.

In addition to the technical data, which is being obtained largely from present and past proceedings of the association, it is planned that the Handbook will include manufacturers' data sheets of commercial appliances used in central station heating work. It is not intended that this matter should be in the nature of advertisements, but for reference purposes only, and along the lines of the Condensed Catalogue of Mechanical Equipment issued by the American Society of Mechanical Engineers.

It is contemplated that the Handbook will be published in a 4 in. x 7 in. size, of the loose-leaf type, similar to the data sheets published by the Lefax Co., of Philadelphia. The proposal of the Lefax Company for publishing the Handbook was looked upon with favor for in addition it would be possible for users to include other technical data sheets published by that company. The first edition of the Handbook will contain probably 55 data sheets and it is proposed to add additional data sheets as important matter appears.

The committee's plan is that the Handbook should be entirely self-sustaining financially. It will be sold to members at $4.00 a copy, including a leather loose-leaf binder. The price to non-members will be $5.00.

Secretary Gaskill in discussing the Handbook, stated that he thought the Handbook would be a reality within six months.

Afternoon Sesion, May 27.

The last paper on the program was on "Advantages and Disadvantages of Steam and Water Heating," by R. V. Stureman of the Stureman-Butterick Co., Springfield, Ill.

(Mr. Stureman's paper, substantially in full, is presented on another page of this issue.)

For the Accounting Committee, A. D. Spencer, chairman presented a tentative classification of heating accounts, which was divided into "Plant Investment Accounts" and "Operating Expenses." Included, of course, in the "Plant Investment Accounts" were the heating plant structures and equipment, steam distribution system, steam meters, customers installations, etc. The "Operating Expense" account was sub-divided into production-operation, production-maintenance, distribution system-operation, distribution system-maintenance, utilization-operation, commercial expense, new business and general expense. The schedule was intended to serve as a practical guide in arriving at the cost of construction and operation in the light of the latest commission rulings.

The final item on the program was the election of officers, the result of which is given in another part of this report. The convention then adjourned.

The Entertainment.

Automobile trips and theatre parties were included in the entertainment of the ladies. On the opening day of the convention the ladies were taken on a tour of the shops on State Street. The automobile trip the next afternoon took the party through the parks along the North Shore, with a luncheon at the Edgewater Beach Hotel.

Wednesday evening was set aside for the convention dinner at the La Salle Hotel. This proved a delightful affair, the entertainment including a number of special features rendered by professional talent.

The retiring president, J. C. Hobbs, acted as toastmaster. Secretary Gaskill was the principal speaker. After extending the congratulations of the association to Mr. Hobbs on the recovery of his health, he made a formal presentation to him of one of the gold badges awarded to all of the retiring presidents.

On Thursday afternoon the ladies went to the Princess Theatre to see "Too Many Husbands."

All of the convention plans were admirably carried out by a committee of Chicago mmbers, consisting of J. L. Hecht, chairman; Earle Shultz, (finance), Fred B. Orr (exhibitors), J. C. Hornung (entertainment), H. H. Clark, S. M. Bushnell, R. C. March, J. C. Butler, C. W. Pendell, G. W. Hubbard and R. C. Cunningham.

With the Exhibitors.

Carrick Engineering Co., Chicago, Ill., had on exhibition the Carrick system of combustion control. The company's interests were looked after by C. C. Carrick, president and general manager.

W. A. Blonck & Co., Chicago, Ill., exhibited Blonck boiler meters for both natural and forced draft. These meters were of the improved type. The Blonck efficiency meter and the CO_2 recorder were also on exhibition. The meters were operated by means of a small blower connected to a small model boiler and in this way conditions affecting the efficiency of the boiler were immediately shown on the meter itself. The meter and boiler were connected in the exhibit in the same way that they would be connected in a power plant installation. The company was represented by A. H. Anderson, president and D. F. Holtman, sales engineer, of the Chicago office.

National Tube Company, Pittsburgh, Pa., showed a length of National Spellerized steel pipe and had an impressive exhibit of literature descriptive of the products manufactured by the National Tube Co. The representations of the company present were K. Llewellyn and J. S. Raymond.

H. W. Johns-Manville Co., New York, showed samples of underground pipe insulation, various samples of insulation for steam pipes, and sheet packing. The exhibit also included the Johns-Manville line of steam traps. The exhibit was in charge of C. W. Scott, assistant manager of the Chicago office. Other representatives of the company present were W. P. Lyons, R. J. Stewart and O. W. Montgomery.

Celite Products Company, Pittsburgh, Pa., had a very interesting demonstration showing the way Sil-o-cel stands up against high temperatures. The exhibit included Sil-o-cel heat-insulating materials, Celite high-temperature cements and Colcote boiler coating. The company was represented by A. W. Knight, manager of the Chicago office, T. G. Lee of the New York office, and H. N. Haberstroh and C. P. Derleth.

National Asbestos Mfg. Co., Jersey City, N. J., had on exhibit a section of Pyro-Bestos underground covering, also a sample of the company's asbestos tapered shingles. The improved method of making connections between sections of Pyro-Bestos underground covering was shown at the exhibit. The exhibit was in charge of C. C. Hall, secretary of the company.

M. H. Detrick Co., Chicago, Ill., had for distribution among those attending the convention literature descriptive of the Detrick-Hagan steam jet ash conveyor, Detrick flat suspended arches and Detrick back arches. R. C. Warner, T. Vaughan and C. F. O'Connell were the representatives of the company in attendance at the meeting.

Ric-Wil Co., Cleveland, O., exhibited a model of a cross section of the Ric-Wil vitrified tile conduit for underground heating pipes. The Ric-Wil display was in charge of Ira D. Siegfried of Cleveland, O. The other representatives of the company present were R. Sutherland, of the Stannard Power Equipment Co., Chicago, and C. G. Gottwald of the Cleveland office.

Crane Company, Chicago, Ill., had a very impressive exhibit showing models of various types of Crane valves and fittings for heating work; valves and material for high-pressure steam were also exhibited. The company was represented by C. E. Ammerson and James Moore, sales engineers, of the Chicago Office, and E. S. Storm, representing the Hoffman Specialty Co.

Bailey Meter Company, Cleveland, O., had an interesting exhibit consisting of photographs and literature of the various types of flow metres manutured by this company. The photographs included details showing the method of construction and operation of the instrument, together with numerous photographs of the Bailey meters as installed in the power plant. Their representatives present were E. G. Bailey, president and W. E. East, Manager of the company's Chicago Office.

American District Steam Company, North Tonawanda, N. Y., displayed numerous models of its line of central station heating equipment, such as underground specialties, casing, variators, expansion joints, steam traps. A model of the Simplex condensation meter was on exhibition together with a St. Johns steam-flow meter. The exhibit also included the Adsco valve for use in connection with the atmospheric system of steam heating. Those present representing the company included H. C. Kimbrough, secretary, B. H. Lewis of the North Tonawanda office, D. D. Hayward and Lloyd Howell, of the Chicago office.

General Electric Company, Schnectady, N. Y. displayed three flow meters, together with accessories for measuring the flow of steam, water and air, the company was represented by J. H. Hoelz, sales engineer, of the Chicago Office.

Central Station Steam Company, Detroit, Mich., displayed a standard size "A" Detroit condensation meter such as is used for measuring the amount of condensation in central station heating work, together with a Wright special heating trap. The exhibit also included a number of photographs showing the Detroit feed-water meter and Detroit condensation meters of the steel-case construction, such as are manufactured by this company for power plant work and for metering large amounts of condensation. Those representing the company were J. V. Redfield, president and manager; D. T. Wallace, manager of the company's Minneapolis Office, W. R. Owen, of the Detroit factory; and W. K. Abernethy, manager of the company's Chicago Office.

Republic Flow Meters Co., Chicago, Ill., had a booth at the convention but due to the unfortunate circumstances of a foundry strike the company found it impossible to exhibit any models of the Republic steam flow meters. The company was represented at the convention by J. D. Cunningham and C. E. McGregor of the home office.

Powers Regulator Co., Chicago, Ill., showed a very complete exhibit of the temperature-regulating apparatus manufactured by this company. The exhibit was in charge of W. P. McFarland, sales engineer, of the Chicago office.

J. C. Hornung, Chicago, Ill., had on display model of the Hornung pressure and temperature control valves, Eclipse steam traps, C. S. strainers, together with other central heat appliances. The Hornung magnetic valve, which is used in connection with the P. & T. control valve, electrically-operated control, formed an interesting part of the exhibit.

AMERICAN ENGINEERING STANDARDS COMMITTEE

Five additional bodies have been admitted to representation on the main committee of the American Engineering Standards Committee. They are the electrical Manufacturers' Council; Fire Protection Group, including the National Fire Protection Association, National Board of Fire Underwriters and Associated Factory Mutual Fire Insurance Companies Underwriters' Laboratories; The National Electric Light Association; National Safety Council; and Society of Automotive Engineers. These, with the five engineering societies who founded the committee and the three government departments added later, make a total of thirteen organizations having representation on the main committee.

Standardization of Pipe Flanges and Fittings.

The American Society of Mechanical Engineers has been requested by the American Engineering Standards Committee to assume sponsorship in the standardization of pipe flanges and fittings. In 1914, this society issued a report covering a schedule of pipe flanges and fittings, for diameters from 1 in. to 100 in. for 125 lbs. pressure, and also a schedule for extra-heavy pipe, covering a range from 1 in. to 48 in. diameter, and for 250 lbs. pressure. In 1918, a supplementary report was published for working pressures of 50, 800, 1200 and 3000 lbs.

While the work has not been active during the last year, it is now proposed that it be continued, the society being formally recognized as sponsor, under the rules of procedure of the A. E. S. C.

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NUMEROUS recent inquiries regarding the adaptability of kerosene and other hydro-carbons as a fuel for heating homes has led to the reopening of an old subject which, it might be thought, had long since been completely exhausted. However, in the light of present-day developments in the coal industry, kerosene has again elbowed its way to the front in a way to challenge the attention of engineers.

The topic was up for discussion at a recent meeting of the National Warm Air Heating and Ventilating Association where the points made by the principal speaker will be found of more than ordinary interest. He stated, for instance, that the successful liquid fuel burner in a house must be reasonably quiet in its operation, besides being dependable and automatic. It must function perfectly without an attendant. It must meet the rigid requirements of the fire underwriters. It should decrease and certainly not add to the fire hazard. Finally, it must adapt itself to existing heating plants without physical change thereof. He then asks, is it possible to construct a liquid fuel-burning device that will meet all these requirements, and states that such a device can and is being manufactured on a commercial basis.

Taking up in order the vaporizing and atomizing methods of burning kerosene, the speaker dismissed the vaporizing method with the statement that the conversion of the liquid to a gas necessitates the application of heat and the subjecting of the liquid to great pressure. It is this application of heat and high pressure that renders the vaporizing system of liquid fuel-burning unfit, in fact, prohibitive for use in connection with the heating of homes. Atomizing the fuel by the use of the usual means of high-pressure air, steam or fuel pressure, with the resultant large mass of roaring non-controllable flame, would be equally unfit for domestic use, but, as the speaker went on to show, it is now possible to properly atomize and maintain control of the flame without the application of pressure.

Intense combustion is easily attained with a charcoal fire by reason of the fact that the fuel remains solid at the temperature of ignition. It thus presents a large surface for the oxygen to act upon, and an atom cannot break away and go up the chimney without at least being united with an atom of oxygen. In the combustion of liquid fuel, however, the fuel is already on its way to the chimney before it is even partly burned, in the ordinary devices. The first effect of heat is to separate the carbon from the hydrogen and should there be carbon left alone, it is much less favorably circumstanced than that in a charcoal fire. If it can attach itself to a hot coal capable of receiving a blast of air, its combustion would be easily accomplished, but, instead of this, it is usually carried along by the current of gases and, unless it is given plenty of time before being cooled, it will be left alone as a particle of soot. If, therefore, a liquid fuel-burning device were constructed in which the walls of the combustion chamber were walls of flame and diffusion were well developed, if not entirely completed, before the beginning of combustion, we would be fast approaching a mixture akin to the chemical mixture of smokeless powder.

These, in brief, being the requirements, the speaker described the efforts to develop a burner to meet them and which, he announced, have now been crowned with success. In fact, such progress has been made with the device under consideration, that in projecting the finely-divided fuel mixed with the proper proportion of air into a white-hot flame-walled furnace, every atom of CO, simultaneous with its formation, is met by and combines with that other atom of oxygen to the immediate formation of CO_2. The time element, so difficult to control in the combustion of coal, is here absent.

It will be interesting to see how far the engineering world will go in taking up once more with kerosene fuel. That it has possibilities that were never fully realized until the present crisis focussed fresh attention upon it, is becoming generally recognized. At any rate, it will be worth while for all concerned to familiarize themselves with this, as well as with other recent developments to place kerosene where its advocates think it belongs.

WE REGRET to announce that it has been necessary to put off until next month's issue the publication of the description, as promised to our readers, of the Hill synthetic air chart, which was adopted as a standard measure of ventilation at the recent semi-annual meeting of the heating engineers' society. The description will be accompanied by a number of examples, making it possible for the ventilating engineer to thoroughly familiarize himself with the chart so as to make it readily available in his work.

WRINKLES

Unique Application of Air-Line Pump.

Two unique arrangements for vacuum systems are described below. Both methods have proven successful on installations of various sizes and can be relied on to give satisfaction when properly designed. In most cases where these connections were used the piping system was designed to work equally well by gravity so that the vacuum pump was used primarily to assist in obtaining quicker circulation.

These methods both require some positive means such as a direct return trap or a condensation pump to return the water to the boiler. Air, the enemy of all heating systems, is taken care of by means of an air-line pump.

Fig. I shows a condensation pump and an air-line pump used in combination. All returns enter the pump tank as in straight gravity work. From the tank a small connection is run to the air-line pump suction. The pump exhausts to atmosphere. The degree of vacuum is controlled through an electric vacuum switch which can be obtained from the various manufacturers of electric controlling devices.

The operation of the apparatus is briefly this:

Assuming the switch to be set to close the circuit at 4 in. of vacuum or under and to open at 8 in. The fireman, upon arriving in the morning, will throw in the line switch which will start the air-line pump. When all of the air is exhausted from the system a vacuum will be created in the pump tank and return pipe and when 8 in. is indicated on the

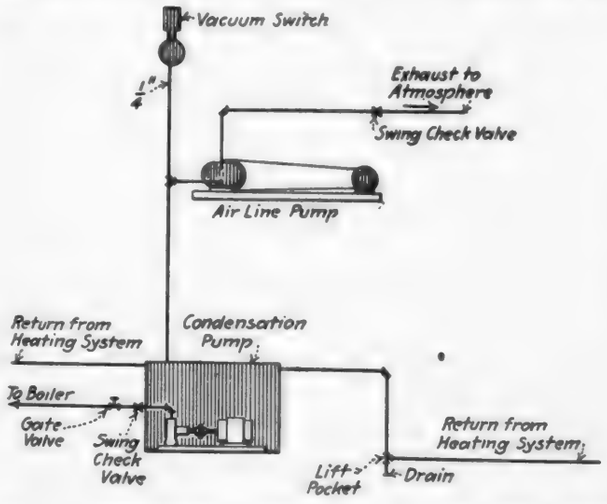


FIG. 1—CONDENSATION PUMP AND AIR-LINE PUMP USED IN COMBINATION.

gauge the vacuum switch will open the circuit. When the amount goes below 4 in. the circuit is closed automatically and the same cycle followed.

The operation of the condensation pump is governed by the ball float in the tank which closes or opens the line to this motor at set points.

In the majority of cases the line switch for vacuum pump can be opened after steam has circulated through the system.

Fig. 2 shows a similar method, using a direct-return trap and an air-line pump. In this case a connection is taken from the trap vent through a small steel tank and then to air-line suction. The tank is used so as to maintain a vacuum without causing the pump to work continuously or without benefit to the circulation when the trap is discharging.

While the trap is filling the vent is open and the vacuum is, therefore, carried into the return. As soon as the trap is filled, the vent is closed and the pump creates a vacuum in the tank.

These methods can be used in place of the so-called return-line vacuum pumping units which, though operated with a single motor, require more horse-power than the total of two small motors where the condensation and air-line pump

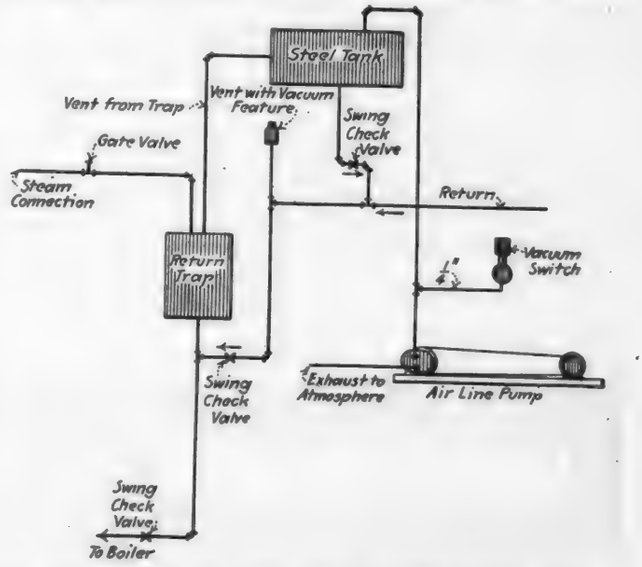


FIG. 2—DIRECT-RETURN TRAP AND AIR-LINE PUMP USED IN COMBINATION.

are used. This method also has the advantage of two independent and less complicated units. The two units are desirable over the single return-line outfit because approximately eight times the volume of air is handled, as compared to water. Consequently, the two pumps can be better adapted to the individual requirements of air or water, also to the variable boiler pressures.

Eliminating Dust with Wet Fan Blades.

A Frenchman, M. A. Richet, has conceived the idea of clearing the air of an enclosed space of the particles and dusts, microbe or mineral, that it contains, by causing a sticky liquid or even water only, to fall on a fan in movement. The arrangement is explained in *L'Edilite Technique.*

The fan housing is so arranged with an opening at the bottom and top as to be exposed to water dripping from a tank directly above the fan. The liquid falls drop by drop on the blades and is projected against the housing in the form of spray. It is then collected in a receiver.

Several liquids have been used by M. Richet, including glycerine and soapy water. The process is stated to be especially useful for the chemical purification of the air, using copper chloride for carbonic oxide and potash or soda for carbonic acid.

In one installation cited by M. Richet, nearly 100,000 microbes were collected in three hours with a fan delivering about 43,000 cu. ft. of air per hour. The quantity of organic matter was 0.3 grains and of mineral matters, 0.08 grains.

MODERN PRACTICE IN VAPOR HEATING

EDITOR'S NOTE: For the purpose of this series of articles, a vapor, vacuum, vapor-vacuum, vacuum-vapor, atmospheric, modulated or thermograde system of heating will be considered as any system in which the steam pressure ordinarily carried is practically at atmosphere or slightly below or in which the returns are open to the atmosphere and where no pump or other positive mechanical device is employed to pull back the returns.

XXIV—O-E PERFECT SYSTEM.

In the design of the O-E Perfect system of heating every effort has been made to reduce the number of parts to the fewest possible, on the ground that the demand of the times is for simplicity in the construction and operation of vapor systems. As will be seen from Fig. 1, illustrating a typical layout of this system, the special devices used are limited to packless graduated radiator valve, a water seal and ball check union elbow on the radiator return and an air exhauster and vacuum valve located on the return main near the boiler.

OPERATION OF SYSTEM.

Vapor generated at the boiler passes up through the main supply pipe and is distributed to the several radiators in the rooms above by a small individual supply pipe from the main, being admitted to the radiator at the top through an O-E packless graduated valve. As the vapor condenses in the radiator the water of condensation falls to the bottom of same and is returned to the boiler through a 1/2-in. O-E elbow connected into a 1/2-in. pipe, thence into the main return pipe in the basement.

In passing through the elbow the water is first trapped by means of a wall or diaphragm, cast in the elbow, outside of the radiator (Fig 3) making a water seal which is designed to hold the vapor in the radiator and to prevent it from short-circuiting into the return main.

Should the supply valve at the top of the radiator be closed, condensation will naturally take place in the radiator as it cools, thus forming a vacuum which would be annoying if an ordinary elbow was used on the return, as any water that might be in the return pipes would be drawn back into the radiators, producing a cracking or pounding noise. Means are taken in the O-E elbow to avoid this trouble by equipping it with a small brass ball operating on a smooth guide or track and arranged so that when the vacuum is formed in the radiator the ball will immediately roll against the port and prevent water from being drawn into the radiator from the return pipe. The manufacturers lay emphasis on the noiseless operation of this elbow,

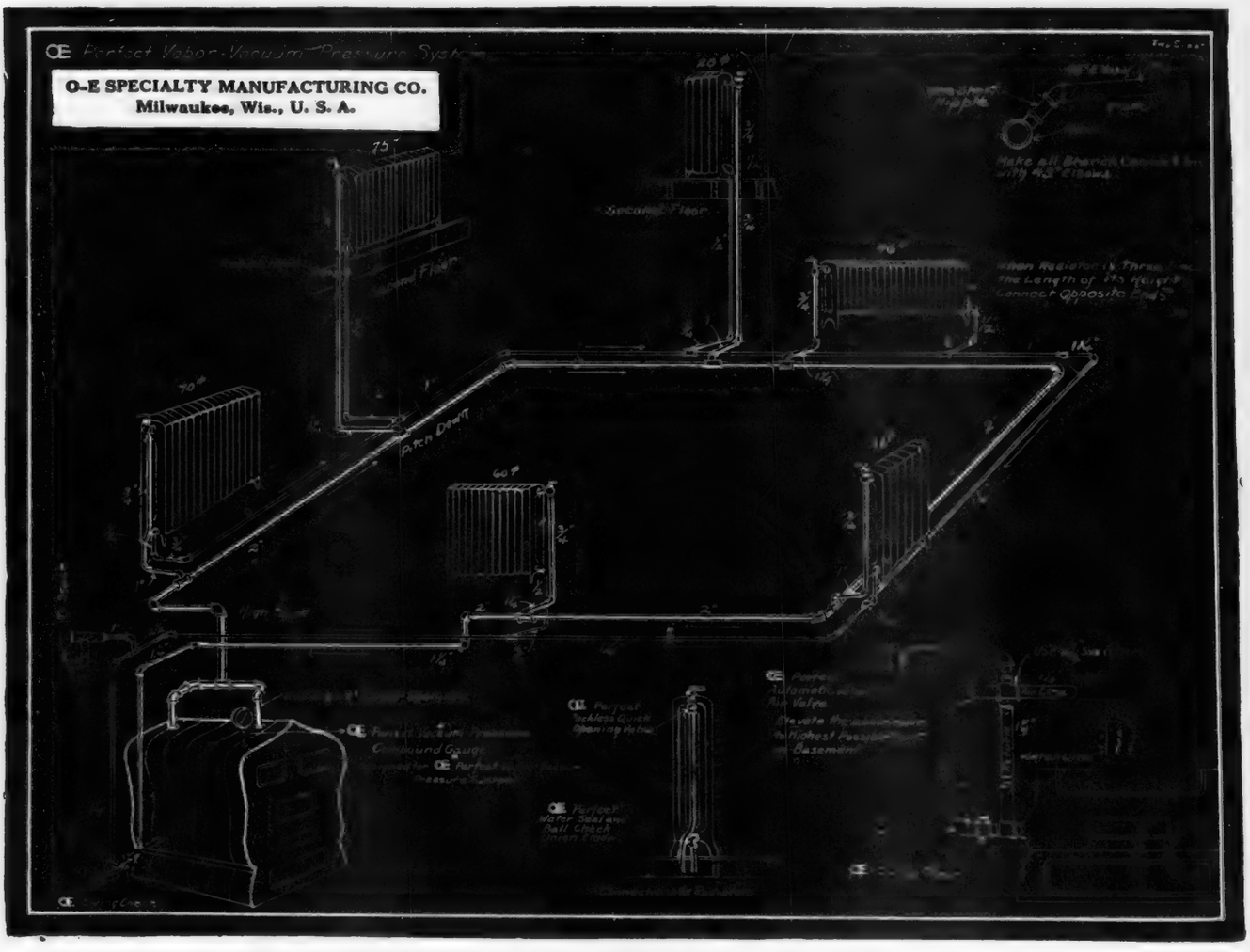


FIG. 1—TYPICAL LAYOUT OF O-E PERFECT SYSTEM.
In larger systems two mains would be used, at least, with separate return lines.

due to the fact that the water seal is below the ball.

As soon as the supply valve on the top of the radiator is again opened the ball in the elbow rolls off the seat, allowing condensation and air to pass into the return main.

It should be noted particularly that an air vent is tapped in the adjustable screw stop of the return elbow. This not only allows the air to escape freely into the return system when the

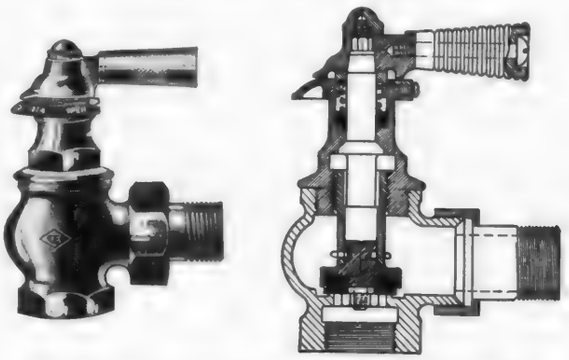


FIG. 2—O-E PERFECT RADIATOR SUPPLY VALVE.

supply valve is open, but also serves to equalize the pressure on both sides of the water seal, thus preventing it from siphoning out, as it might do otherwise.

METHOD OF DISPOSING OF AIR.

All air and condensation passes through the main return pipe in the basement to a point above the boiler where the air is separated from the water. Air being lighter passes up and through the O-E air exhauster (Fig. 4) into the chimney flue, or any place desired, while the water returns to the bottom of the boiler to be again heated for use.

CONSTRUCTION OF DEVICES USED.

The O-E packless valve (Fig. 2) used with this system is of the usual quick-opening type with a handle made of hard rubber and having a graduated dial and pointer. The dial is cast on an angle so as to easily read from a distance.

The fitting at the return connection of the radiator, described as the O-E Perfect ball-check water seal union elbow, in addition to having the features already mentioned, is made with a diaphragm cast integral with the body of the elbow to make

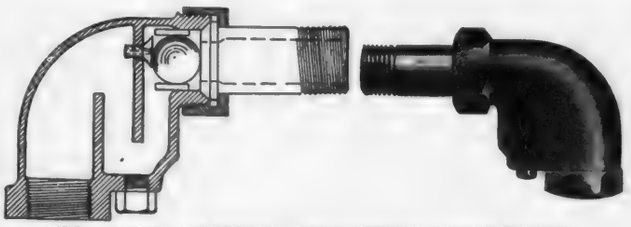


FIG. 3—O-E PERFECT BALL-CHECK WATER-SEAL RETURN FITTING.

a sure water seal. Another feature of this device is a clean-out water plug below the water seal, making it easy to remove any sediment that may find its way into the system, as when first put into operation.

The device for exhausting the air from the system, described as the O-E improved air exhauster and vacuum valve, is connected at a high point above that where the return main drops down to the return opening in the boiler. The exhauster remains open while there is any air in the system. As soon as heat comes into contact with a carbon post in the exhauster, the post expands and forces a hollow brass ball against the seat, closing the port. When closed the system will cool slightly, causing a vacuum to form, and this will hold the ball on the seat of the exhauster as long as there is a vacuum in the system. As soon as the vacuum is lost, on account of air getting into the system, the ball will roll away from the seat in the exhauster, again permitting the air to escape.

Measures to make the exhauster "fool-proof" are taken by having a brass shell or reinforcement around the carbon post, with a brass cap over the end of the post, to prevent the post from getting out of shape if, for instance, it should be screwed down against the seat when cool. The cap locks the expansion post after it is properly adjusted. All exhausters are set for ordinary use, but can be adjusted to suit any particular system to which they are attached. They are threaded 1 in. both inlet and outlet.

SUGGESTIONS FOR INSTALLATION.

A number of useful hints for the installation of the O-E system are offered by the manufacturers. Boiler supply tappings, it is suggested, should be connected and should extend full size of openings to the highest possible point and the proper size of main determined from the accompanying table:

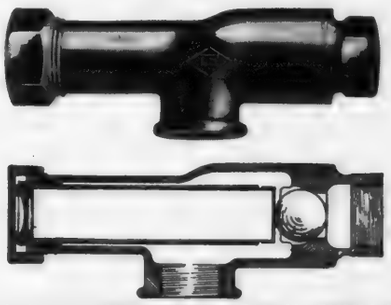


FIG. 4—O-E AIR EXHAUSTER AND VACUUM VALVE.

TABLE FOR FIGURING PIPE SIZES

Size of Main In. Diam.	Length of Main. Ft. 50	100	200	400	600	1000	1500	2000	Size of Return In. Diam.
	square feet of radiating surface								
1	85	65	50	40	35	30	25	20	½
1¼	180	120	100	80	70	60	50	45	¾
1½	320	240	190	150	130	110	90	80	1
2	530	390	310	250	210	180	150	135	1
2½	1130	870	670	540	460	390	330	290	1¼
3	2050	1600	1250	1000	870	740	620	550	1¼
3½	3270	2590	2040	1650	1430	1210	1020	900	1¼
4	4860	3900	3100	2500	2190	1850	1570	1390	1¼
4½	6760	5480	4390	3630	3120	2630	2230	1960	1½
5	9040	7270	5810	4660	4260	3510	3080	2710	1½
6	11720	9720	7900	6460	5680	4810	4210	3630	2
7	18330	15800	12870	10680	9390	7980	6720	5040	2
8	26360	22840	19090	15930	14120	12040	10290	9130	2
9	35990	31620	26910	22680	20180	17120	14330	12720	2½
10	46620	41420	35580	30170	26920	23150	19790	17380	2½
12	60460	53650	46710	40050	35860	30890	26540	23610	2½
14			73210	63870	57660	49950	43080	38400	2½
15					86400	75430	65310	58290	3
16							85770	71910	3

RADIATOR CONNECTIONS.

1 to 75 ft., ¾ in. x ½ in.
75 to 150 ft., 1 in. x ½ in.

SUPPLY RISERS.

1 to 75 ft., 1 in.
Over 75 ft., same as main.

RETURN RISERS.

1 to 300 ft., ¾ in.
Over 300 ft., same as main.

All pipe to be figured as radiation. If covered, take one-half of surface. If uncovered take two times the surface.

Length of main is distance to farthest radiator. Make allowance for unusual exposure.

If necessary to reduce, use reducing ell at the high point; never reduce at the boiler.

Extend the main from the boiler around the building to be heated, pitching down at least 1 in. to every 15 or 20 ft. Where radiators are located a considerable distance from the boiler, two or more mains should be used to equalize the distribution of the vapor, using full size supplies if possible.

When the main reaches a point where the first radiator is to be connected, use a 45° elbow and short nipple, and extend the arm one size larger than the riser. It is added that it would be well to have the riser one size larger than the valve opening. Arms from the main to the radiators should be pitched up at least 1 in. to 3 ft.

The return main, it is recommended, should be started where the first radiator is taken off the supply main, and the riser and arm should be one size larger than the radiator return openings. The main air line return should be extended along with the vapor main, pitching down same as the vapor main and, of course, increasing in size to proved for the added duty.

Special attention is directed to the method of connecting the supply return drip and air line return. These returns, it is stated, should be at least 28 in. above the water-line in the boiler at the point where they drop to return to the boiler. If possible, 30 or 36 in., it is added, would be even better. Of course, on a large job or with a long main, it is necessary to have ample distance between these two points to provide for loss in pressure. Where the returns, both drip and air line, connect to the return opening in the boiler, the use of O-E swing check valves is recommended.

The air exhauster in the basement, must be connected in a horizontal position and the opening from the pipe to the flue should turn down and then piped into the smoke flue. The manufacturers recommend the connection to the flue for the reason that the partial vacuum created by the draft in the flue makes it unnecessary to have pressure in the system at any time to expel the air. Only extra large pipe, it is stated, not less than 2 ½-in., should be used between the exhauster and the air-line return. If too close to the water-line, it will be necessair line return into one exhauster, an exhauster for each line is recommended, for the reason that when more than one line is connected, unless all are carrying the same amount of radiation, the one carrying the smallest amount will be relieved of air first and is likely to close the exhauster before the others are relieved.

Where the basement ceiling is low, making it impossible to have proper distance between the water-line and the end of return, and if the return is not too close to the water-line, it is, of course, possible to use a loop or water seal, that is, having the main extend a few feet after leaving the last radiator, then drop to the floor and return, before connecting into the air-line return. If too close to the water-line, it will be necessary to use a receiver.

Valves may be connected at either end of the radiator, but the company recommends the same end as the return, unless the radiator is three times the length of its height. In such cases connections at opposite ends are advocated, with the supply valve at the top of the radiator.

Another point to bear in mind is that the return elbow should be level to obtain the best results. This return fitting ½-in. size will handle up to 250 sq. ft. of radiation.

In ordering radiators for vapor heating systems, it is suggested that the directions read: "Wash thoroughly for vacuum systems, plug all openings with wooden plugs, and plug air vent tappings with iron plugs. Tap all radiators ¾-in. top and ½ in. bottom, same end, unless otherwise specified. Tap eccentric or use eccentric bushings. Use water radiation throughout, and be sure to send only radiators that have been cleaned thoroughly of core and other foreign matter."

CORRESPONDENCE

Symbols for Heating Terms.

EDITOR HEATING AND VENTILATING MAGAZINE:

I beg to submit the following symbols for commonly-used heating terms, as suggested by a recent article in your magazine giving a cumbersome symbol for the letters, "B. T. U." Why not entirely discard this cumbersome foreign term and follow the practice of such leading American engineers as Kent, etc., and use H. U. (heat unit) instead? The H. U. symbol, I submit is virtually a combination of the letters H and U, as

H
1 H.U = 1 H
1 Cu. ft. = 1 ¢
1 Cu. in. = 1 ¢
1 Sq. ft. = 1 ⌀
1 Sq. in. = 1 #
1 Ft. = 1 '
1 In. = 1 "
1 Lb. = 1 #
1 Deg. Fahr. = 1 °
1 Calorie = 1 ¢
H.U. per lb. = H/#
H.U. per sq. ft. = H/⌀
H.U. per sq. ft. per deg. fahr. = H/⌀/°
Lbs. per sq. in. = #/#
Lbs. per cu. in. = #/¢
Lbs. per cu. ft. = #/¢
1 Unit of Evaporation (965.7 H.U.) = 1 #

P. J. D.

The Open Window as a Fuel Waster.

EDITOR HEATING AND VENTILATING MAGAZINE:

The writer has read with a great deal of interest the article in the June issue entitled, "What the Open Window Does to the Coal Pile," in view of the fact that the same sentiments are expressed in the enclosed catalogue under the heading "Fuel Economy and the Gorton Quarter-Turn Packing-Lock Valve." We, as well as other manufacturers of heating boilers, have always had this condition to contend with and have had many boilers condemned as "coal eaters," simply because people will open windows instead of turning off radiators. It was this condition that led us to devise a quarter-turn packing-lock valve. We realized that the user must be supplied with a valve that would make it easier to turn off a radiator than to open a window, because it is human nature to do things the easiest way. For this reason the average person will not turn off a radiator, but will open the window instead, because the ordinary valve turns hard and requires from 8 to 12 turns of the wrist to open or close it.

The writer was also interested in the results of tests made in an apartment house, for we have estimated that the open window increases the condensation of a radiator approximately 50%. We are, therefore, pleased to see that the tests practically bear out our estimate of increased fuel consumption due to the open window.

New York. JOSEPH A. GORTON.

Effect of Number of Walls on Rate of Heat Loss.

EDITOR HEATING AND VENTILATING MAGAZINE:

Can you tell me what is meant by the different factors for heat transmission given in your "Mechanical Equipment of Federal Buildings," by Nelson S. Thompson. These tables will be found on Page 8 and, it is stated, "are based on Professor S. Homer Woodbridge's calculations for heat transmission per degree difference in temperature between inside and outside air." The table, for instance, for a solid brick wall is as follows:

SOLID BRICK WALL

Inches	One wall exposed	Two walls exposed.
12	0.265	0.232
18	0.210	0.205
21	0.187	0.185
24	0.167	0.150
27	0.152	1.140
30	0.140	0.130
33	0.130	0.120
36	0.120	0.113
40	0.112	0.103

You will notice that the factors for a single wall exposed are greater than when two walls are exposed.

Will you kindly give an explanation of this?

L. A. D.

REPLY BY PROFESSOR HOMER S. WOODBRIDGE

Your correspondent is by no means alone in his failure to recognize the differences in thermal effect between one wall and all walls exposed on heat transmission through a given area of wall. The matter seems to be one in which further elucidation is needed for the benefit of many of the workers and some of the students in the heating field.

I am not responsible for the table of heat losses referred to by your correspondent and which appear to have been derived from graphical tables computed and printed for class-room work nearly twenty years ago. I know nothing as to the correctness of the numerical tables derived from them, though they are presumably without serious faults. I recall no table, except perhaps in class-room blackboard work, in which the losses for two walls exposed are given.

I will therefore confine my present study to the two cases of one wall exposed and all walls exposed.

The phenomena involved in the problem in question may be stated and illustrated as follows:

1. The rate of travel of thermal energy through a wall separating warmer air on one side from cooler air on the other, and also warmer surfaces on one side from cooler surfaces on the other side, must of necessity equal the rate at which heat is "absorbed" on the warmer side by the two processes of convection and radiation, and must likewise be equal to the rate at which heat is yielded by the cooler side, or surface of the wall, to the cooler air and surfaces, by the same dual process of convection and radiation. The rates of absorption, transmission and emission are of necessity equal.

2. If a warmed enclosure has but one wall exposed to outside chill, and three other walls unexposed to outside conditions, of temperature, the inner walls being between equally-warmed rooms and having the temperature of the air of the enclosure, the inside surface of the exposed wall will be cooler than the surface of the three inner walls, and than the air of the warmed enclosure, and will receive heat by convection from the air and by radiation from the inner walls. The rate of heat travel through that exposed wall must equal that received and absorbed by the inner surface of that wall by those two processes of convection and radiation.

3. Let that same enclosure have all four walls exposed to outside temperature conditions of air and surroundings—solar and wind effects being eliminated, as on a quiet night. In this case the inner surfaces of all walls will have the same temperature, and the heat absorbed by them will be from the air, by convection, only. If the room temperature, namely, that of the contained air, is maintained at the same point as that of the enclosure having but one wall exposed, the rate of heat absorption per unit of wall area when all walls are exposed must, and may be shown to, be less than when heat is imparted by both processes of convection and radiation; and transmission cannot be greater than the absorption rate.

Computations for the construction of some dozen graphical tables of heat losses through walls of solid stone, hollow stone, solid brick and hollow brick for materials of low and of high conductivity, as also for wood and other insulating material, were based on the three propositions above set forth.

The particular problems of two walls exposed, or of three walls exposed, are not treated in those graphical tables. The factors vary widely with the relative areas of exposed and unexposed walls, and must be computed, or estimated, for each situation encountered.

A TYPICAL CASE.

By way of illustration, assume a quadrangular room enclosed by walls of equal area, all walls of solid brick, and windowless, and 12 in. in thickness, and the brick of medium thermal conductivity.

In the first instance, let there by but one wall exposed. Let the inside temperature of air and inner wall surface be 70° F. and the outside temperature of air and surroundings be 0°. From the graphical tables, the rate of heat transmission through such an exposed wall is found to be O.240 T. U. per square foot per hour for each degree of temperature difference between inside and outside thermal conditions. Therefore the rate of heat loss per square foot of surface of the exposed wall under the conditions named, is $(0.240 \times 70) = 16.80$ B. T. U. per hour.

The temperature of the inner and the outer surfaces of the exposed wall may be computed as follows: The rate of heat transfer between air and a vertical surface (effect of height of surface not considered) is O.5945 B. T. U. per square foot of surface per hour per degree of temperature difference between the air and the surface. The rate of heat transfer by radiation from wall to wall, when the material is rough brick, is 0.7358 B. T. U. per square foot per hour per degree difference of temperature. The combined rates are therefore 1.330 B. T. U. per hour per square foot of surface.

Therefore the temperature of the inside surface of the one wall exposed must be 70—(16.80—1.33) 57.37°, and that of the outside surface $16.80 \div 1.33 = 12.63°$.

In the second instance, let all walls be exposed. The graphical tables show the rate of heat transmission in this case to be 0.1875 B. T. U. per square foot per hour for each degree of difference between inside and outside temperature conditions, making the total per hour and per square foot $0.1875 \times 70 = 13.125$ B. T. U.

In like manner as above, the temperature of the outside surface of the walls may be computed.

$13.125 - (0.5945 + 0.7358) = 9.87°$.

The temperature of the inside surface of walls must be such that the difference between the inside and the outside temperature will result in the heat transmission found.

The specific conductivity of the wall material not being known, resort may in this case be had to the following method of computation. In the case of one wall exposed it was found that for a heat transmission rate of 16.80 B. T. U. per hour the temperature difference between the inner and outer surfaces of the wall was 57.37—12.63=44.74°. Therefore the difference of the inner and outer wall surface temperatures corresponding to a transmission rate of 13.125 B. T. U. must be

(13.125÷16.80 x 44.74=34.95°.

which added to the temperature found for the outer surface, 9.87°, gives for the temperature of the inside surface of all exposed walls 44.92°.

This approximate method of computation, solely for the purpose of illustration, makes no pretense of mathematical precision. Were it offered in a class-room, a dozen interrogating hands might be lifted because of detection of errors of omission or commission not to be here listed or described. The processes are more complex than the simple illustrative problem here employed indicates. Mathematical precision is a term inapplicable to most practical problems encountered by the heating engineer and contractor;—a statement which of demanding guarantees of the heating contractor by the owner, private or public.

More Data on Laundry Water Heater Problem.

EDITOR HEATING AND VENTILATING MAGAZINE:

In your April number you commented on a letter from the writer, and it is evident that I failed in two previous letters to make conditions clear to you.

The hot well suggestion was intended to apply to the particular installation under discussion and not for general application to all laundries. Similar hot wells in which a coil is placed are in use at the Winstead Steam Laundry, Waterbury Wet Wash Laundry, Lowe's Laundry, Bridgeport, all in Connecticut, the only essential difference being that the coil is composed of big pipes through which water flows to heater but does not circulate. The coils in the above laundries have been in operation over seven years, and at last reports were rendering a considerable saving in fuel.

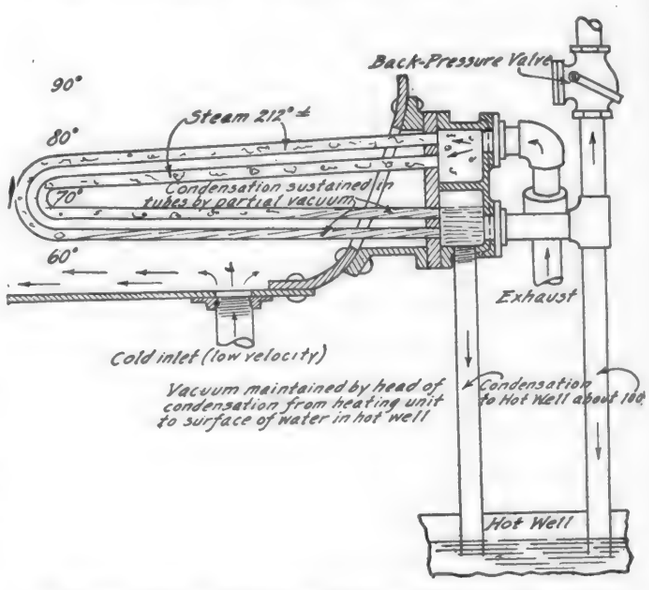
The intention in this case was to use small diameter pipe with circulating pump and, with a high velocity during period of circulation, secure a considerable heat exchange, regardless of whether or not water was being drawn from heater. Space is provided around coils for cleaning out of hot well periodically. The discharge indicated is not intended to be a syphon, as a syphon, if operative, would empty the hot well and leave no body of hot water from which heat could be extracted. This is intended for an overflow, maintaining level of hot water above upper coil and yet discharging the coldest water near the bottom of hot well. Provision should be made for adding a long leg on outlet side to produce a syphon for draining, or additional outlet should be supplied. The latter is the more usual construction, draining hot well.

Your table of temperatures indicates four discharges from washers at 105°; one at room temperature and four at from 140° to boiling. It is contemplated in such cases to run only the water at 140° or over through hot well, the warm and cold solutions being discharged directly to sewer, as shown in sketch, by means of a swiveling elbow at washer.

The acetic acid you mention as corrosive would be used in the cold water and not in the hot. In some of the rinses you give temperature as 105°. The more common practice of laundries is to use cold water, and any increase in temperatures would be a result of the hot fabrics and hot washers.

As stated to you in original letter, the heater in question was never hot below the horizontal center line and rarely, in conditions of heavy service, at a temperature as high as 80°. The lower half of the heater might become heated to 120°, if such a result is possible, with waste heat in hot well and still all the exhaust steam would be completely condensed with the liberal amount of heating surface in heater. In all conditions of heavy draft, the water in hot well would have a temperature considerably higher than that in lower portion of heater. You are right in stating that the total needs for hot water could not be met in this way if all the heat be extracted from waste water in hot well. However, with automatic valves on washers to prevent hot water waste, and all possible heat reclaimed from hot well, a considerable improvement in washing conditions would result. With the big frictional resistance in hot well coil, water would not circulate through coil to any appreciable extent without a pump.

The cold water supply to heater in this case is 4 in., as shown on sketch, and the line of least resistance during periods of draft would be directly into heater, displacing hot water at top through outlet to wash-room. The 1½ in., pump as shown, with frictional resistance of coil, would take but a small percentage of the normal flow from mains through coil and discharge at a low velocity through big pipe near center line of heater, as shown on sketch sent to you.



METHOD OF DRAINING WATER HEATER TO HOT WELL.

We believe that with the conditions of operation that exist at this laundry, the pump could run continuously each working day from June 1 to October 1, without the lower portion of heater acquiring a temperature within 20° as high as that of waste water in hot well. Please note that the pump suction is taken from cold water supply line very close to the heater. Probably, better practice would be to take this supply line from a tapping directly in the bottom of heater, as you imply.

The condition of partial vacuum in tubes referred to is due to the fact that the heating unit is much larger than required to condense the amount of exhaust steam available, which is in this case about 1000 lbs. of steam per hour. The heating unit is capable of condensing nearly 2500 lbs. of steam per hour when water surrounding tubes is at a temperature of 100° (much higher than invariably exists). At the prevailing temperature of water surrounding tubes, undoubtedly considerably over 3000 lbs. of steam could be condensed with the heating unit supplied. Under conditions such as we describe, with U-tube heating unit, the upper portion of loop only is filled with steam while the lower portion is largely filled with condensation, and, surrounded by cold water to which it imparts its heat, therefore the cold water leaves heater at a temperature considerably below 100°. The sketch herewith makes this point clear.

With U-tubes so arranged that they drain perfectly, any increase in power load which produces an augmented volume

of exhaust, results in the displacement of condensation by entering steam, and thus a maximum of heat efficiency is secured. Where a considerable fall occurs on the drip from the exhaust heating unit, and a water seal is provided, the back pressure valve closes against air ingress, thus maintaining in the heating unit a vacuum equal to the head obtained by the weight of water in drip pipe. This makes unnecessary the addition of any trap, unless it is desired to discharge the condensate to a point above drip outlet.

Your suggestion for a supplemental live steam heater would be an excellent one if the problem was merely to secure additional hot water. Such, however, is not the case, as the present live steam heating unit at top of shell, supplementing the heat obtained from exhaust in lower heating unit, is amply sufficient to supply all the hot water requirements of this laundry. Unfortunately, however, the engineer at this plant prefers to use the upper heating unit to remove heat from condensation discharged from various flat work ironers, dryrooms, presses, etc., on its way to the sewer instead of running this condensation directly back to the boiler either through pump and receiver or a return trap system. It is their desire to secure additional heat without using any live steam from the boilers, which they consider are now overloaded. Any consulting engineer would doubtless advise them to return condensation from various heated machines through either a return trap or pump and receiver, and by this economy they would be able to afford the necessary live steam under automatic control in upper heating unit to supplement the hot water obtained by waste heat, and thus supply sufficient hot water.

The writer loosely referred in previous correspondence to horse power instead of pounds of steam, as he habitually makes mental calculations based on 30 lbs. of steam heating 25 gal. of water per hour to 180° with steam at atmospheric pressure, and failed to realize that others did not consider a HP unit as the equivalent of 30 lbs. of steam. The engineer has known of so many cases where serious injury occurred to boilers through oil that was not entirely removed by an oil separator, that he much prefers to waste the small amount of heat in exhaust condensation at an average of less than 100° to running the danger of oil in boilers by returning condensate containing oil.

The exhaust heating surface is proportioned to condense all the exhaust steam from the engine and it is not the intention of the heater builder to provide all the hot water required through the use of one heating unit. The exhaust heating unit is capable of condensing nearly 2500 lbs. of steam per hour, whereas in times of greatest draft not over 1200 lbs. of condensation per hour flows from this heating unit. It is evident that the exhaust heating unit is amply large. It is not large enough to supply the amount of water required by this laundry, and it was not intended to be, as a supplemental live steam section was installed for the purpose of giving the total requirement in hot water when supplied with sufficient live steam at boiler pressure.

By reference to my first letter, you will find that the laundryman was advised to purchase another exhaust steam heater for the purpose of getting additional heat from exhaust, even though none was at the present time being wasted.. The problem is wholly one of getting more hot water from waste heat.

I regret that my previous letters were obscure on so many points, which handicapped your engineer in his very capable replies.

Philadelphia, Pa. W. W.

The use of small diameter pipe in the hot well allows a greater amount of heating surface in proportion to the volume of the flow and a higher velocity of flow than if pipe of larger size were used, but the proportionate friction surface encountered by the flow is considerably increased and this means an increased cost of pump operation.

If all the hot water used in the laundry and drawn through the water heater were made to pass first through a pipe coil in the hot well, it is obvious that circulation in this coil would be greatly increased thereby, and consequently also the transfer of heat from the hot well to the water in the coil. Just how valuable this increased circulation is may be more readily seen by noting that a 2500-gal. hot water demand requires a flow through the 4-in. cold water supply pipe of 63 ft. per minute.

This method would necessitate the installation of larger size pipe and therefore less heating surface could be placed in a given space, but, with the increased temperature difference between the inside and outside of the pipe, the heat exchange due to the temperature difference would be more rapid than if only the hotter water from the water heater were circulated through the pipes. On the other hand, with a given pump capacity, the velocity of flow due to the pump alone decreases with an increase in pipe size.

Just which method is best and all around feasible is dependent upon a number of circumstances and which method would give a greater heat exchange could doubtless be settled only by a practical test, considering that a number of elements enter into the situation such as varying total amount of heating surface, proportionate heating and friction surface presented to the flow, temperature difference, total quantity of water flowing and velocity.

LIMITATION OF CORRESPONDENT'S METHOD.

With the correspondent's method, the heat can be reclaimed from the hot well only during periods of heavy draft extending from April until November, but with the method mentioned herein, the heat can be reclaimed at all times since the water in the hot well would always be higher in temperature than the entering cold water supply in the pipe coil. The temperature of water in the water heater would at times become higher than that in the hot well but no heat could be lost from the heater through the pipe coil to the hot well since the cold water supply entering through the pipe coil would prevent hotter water in the heater from circulating down in opposition to the laws of gravity. At such times, circulation would simply stop automatically, but the cold water passing through the coil to replace the hot water withdrawn from the heater would still be taking up heat.

If the foregoing method is not followed, the cold water pipe to the water heater should at least pass independently through the hot well even if the pump and a separate coil of small diameter pipe is also used.

A still further saving is possible by making the cold water supply pipe to the feed-water heater or boilers also pass through the hot well while in some laundries, where the chimney draft exceeds the requirements, a cold water pipe is run through the smoke breeching and stack to a wood water-storage tank on the roof, the tank then serving as another source of hot water supply.

The hot well, pipe coil and water heater at top and bottom, should each be provided with a thermometer and before discharging hot water into the well it would seem a better practice to empty the latter by means of an outlet drain valve having a handle extended for control to the floor above. Hot water suddenly discharged into a long hot well, even if provided with an overflow pipe taking cold water from the bottom, would give up heat to the colder water and mix with such water to a considerable extent, in particular at the end opposite the overflow pipe.

FIGURING CAPACITY OF HOT WELL.

Taking an average from the record of a few days for the amount and temperature of usable water discharged from the washers or other laundry fixtures, will give the necessary

data for figuring the capacity of the hot well. Knowing the usual temperature and amount of the water to be circulated in the pipe coil and whether the coil is of iron, brass or copper, it is then not a very difficult matter to compute the approximate lineal feet of pipe coil required. Copper is doubtless too expensive a material, though of longer life and greater by far in its rate of heat transmission. Some allowance should be made for the size of pipe used and a possible decreased rate of heat transmission of 50% for fouling of the pipes since even if the latter are kept in good condition, the nature of the surrounding soapy waste water is such as to coat the pipes in a few moments. The temperature difference in the present case is the difference between the mean or average temperature of the incoming and outgoing water in the pipe coil and the mean temperature in the hot well.

The water in the well is not at an even temperature throughout since in large bodies of water, there is a zone of which the pipe coil is the centre where the mean temperature of the water will be much lower. The water cooling by contact with the coil lowers slowly by convection, permitting hotter water to take its place. The results would be much better if the water in the hot well could be agitated by some economical method.

USE OF OIL SEPARATORS GOOD PRACTICE.

With an oil separator of good make and large storage capacity arranged for proper drainage under conditions of vacuum as well as pressure, there should be no trouble arising from oil in the boilers as the use of oil separators is well established and good practice. A frequent trouble with oil separators is in the use of an oil which is too volatile, thus allowing some to go through the separator without striking the baffles at all. The baffles should be frequently cleaned, and the efficiency of the oil separator should then be from 95% to 99% elimination of the total quantity of oil used.

It is indeed unfortunate, as the correspondent states, that the engineer prefers to waste condensation and some of its heat to the sewer by passing it through the live steam coil rather than return it to the feed-water heater or boilers.

The same error is repeated in the proposed method of draining the water heater to the hot well and might also result, during periods of slight draft when the lower heating unit is completely drained, in the blowing of exhaust steam directly into the hot well. If this method is used, it were better if the two pipes as shown in the sketch were provided with loop seals of sufficient depth to prevent passage of exhaust steam direct into the hot well. The saving possibly by returning the condensate to the feed-water heater is not of any great amount during periods of heavy draft (about 1½ H. P.). but at other times this figure might increase to 5 H. P. The water saved would be at least 150 gal. per hour.

Co-Ordinating Convention Dates.

EDITOR HEATING AND VENTILATING MAGAZINE:

I was greatly interested in reading your editorial in The Heating and Ventilating Magazine for May, in which you suggested the desirability, not to say necessity, of co-ordinating the dates of national conventions of important organizations.

You will be interested to know that during April, I wrote a letter to Ernest T. Trigg, President of the National Federation of Construction Industries, and to Ralph P. Stoddard, chairman of the Staff Council of that association, suggesting that a special committee be appointed for the very purpose of co-ordinating all the dates of every association or other organization in the building industries, so that if possible they will not conflict, nor come so close together as to make it impossible for those interested to travel from one convention to the other.

This has often impressed itself upon me before, but not so strongly as it did when the annual meetings of the A. I. A. and the National Fire Protection Association came on the same dates, one in Chicago and one in Washington. As a member of long standing, having official connections with both of these organizations it was a serious inconvenience as well as a disappointment to me that this should happen, and I felt about it just as you described it in your editorial in connection with the heating and ventilating professional and industrial associations.

Let us hope that something will result from our efforts.

D. KNICKERBACKER BOYD.

Philadelphia, Pa.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Michigan Chapter Elects New Officers.

New officers of the Michigan Chapter were elected at the June meeting, held at the Detroit Boat Club, Detroit, June 16. The outgoing administration was paid a warm tribute for the success of the season just closed. The officers for the ensuing year are: President Edward E. McNair; vice-president, William B. Johnston; secretary, Edwin R. Little; treasurer Harry A. Hamlin. Board of governors: J. Lansing Fuller, Francis T. Schreiner, Jr., and R. S. M. Wilde.

Co-Operation in Building Industry Discussed by Kansas City Chapter.

Co-operation in the building industry, viewed from the standpoints of the architect, builder, sub-contractor and material man, proved a live subject at the May meeting of the Kansas City Chapter of the heating engineers' society. President Sheppard presided at the meeting which was held at the Savoy Hotel. John G. Pease was chairman of the committee in charge.

The architects' viewpoint was presented by A. S. Keene, former president of the Kansas City Chapter of the American Institute of Architects. Many of the points he made were in line with those reported in THE HEATING AND VENTILATING MAGAZINE for February, 1920, detailing the architects' movement to improve relations with the engineers and with the public.

Paul Fogel, president of the Kansas City Builders' Association emphasized the importance of closer acquaintanceship as the basis of confidence and the possibility of easier agreement among conflicting units. He urged employers to treat their employees less as machines and more as human beings, whose interests are not forgotten. He characterized the building industry as more hazardous than any other and yet it is the poorest in organization. He urged greater uniformity in practice.

W. N. McIntyre, speaking for the sub-contractor, stated that men cannot co-operate successfully when the main feeling among them is self-interest. He strongly criticised present contract agreements which provide that the contractor must guarantee the successful operation of equipment designed by other parties.

For the material man, Clarence A. Burton made the point that present-day conditions prevent one from accomplishing any great object unaided. Co-operation means responsibility, a nearer approach to perfection in results accomplished, honor in transactions, and co-operation plus organization means execution.

ORGANIZATION OF FEDERATED AMERICAN ENGINEERING SOCIETIES

Representatives from no less than 61 engineering societies were present in Washington June 3-4, in response to the call for a joint conference of the engineering profession of the United States. Among the national bodies represented were the American Association of Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, American Society of Heating and Ventilating Engineers, American Society of Refrigerating Engineers and the American Society for Testing Materials.

At the second day's session a permanent organization was formed under the name of the Federated American Engineering Societies, with the declared purpose "to further the interests of the public through the use of technical knowledge and engineering experience, and to consider and act upon matters common to the engineering and allied technical professions."

In the organization of the new body it was finally decided, after considerable discussion, to have the organization made up of societies and affiliations, and not of individuals. The membership will be divided into national, local, State and regional classes.

The opening meeting was held at the Cosmos Club, Washington, and was presided over by Richard L. Humphrey, consulting engineer, of Philadelphia, and chairman of the Joint Conference Committee. He stated that invitations had been sent out to 110 engineering organizations, representing an aggregate membership of 120,000. The delegates present, he added, represented an aggregate membership of over 100,000.

The conference organized with the election, as chairman, of Calvert Townley, president of the American Society of Electrical Engineers. John C. Hoyt was elected secretary.

Resolutions as to the purpose of the organization and its membership were then presented by Major Gardner S. Williams, representing the Grand Rapids (Mich.) Engineering Society. These resolutions were the basis upon which the organization was finally formed. In their original form they read:

"Resolved, That it is the sense of this conference that an organization be created to further the public welfare where technical knowledge and engineering experience are involved and to consider and act upon matters of common concern to the engineering and allied technical professions, and

"Resolved, That it is the sense of the conference that the proper organization should be an organization of societies and affiliations and not of individuals."

At the afternoon and evening sessions on June 3 a number of prominent speakers addressed the conference on such subjects as "Functions of the Engineer in Public Affairs," and "Publicity for Engineers."

The second day's session was largely devoted to the report of the Committee on Constitution and By-Laws, of which R. L. Humphrey was chairman.

After deciding on the name and objects of the organization the report, as finally adopted, provided that the management is to be vested in a body known as the American Engineering Council which is to have an executive board. The council will be made up of representatives of organizations on the basis of one representative for a membership of 100 to 1000, inclusive, with one additional representative for each additional 1000 or major fraction thereof.

Officers will include a president (elected for two years and ineligible for re-election), four vice-presidents (two elected each year for two years), and a treasurer (elected for one year). There is also to be an executive officer, or secretary, appointed by the executive board.

It is provided that the organization shall be conducted by an Executive Board of thirty members, six to be the officers elected by the council and twenty-four selected, a part by the national societies and the remainder by the local, State, or regional organizations, according to districts.

Dues are based on the number of members of the affiliated societies, each national society contributing $1.50 per member and each local, State or regional organization $1.00 per member, annually. Provision is made for the formation of local affiliations and State councils, care being taken to include specific delimitation of authority between the various bodies.

Although the vote on adopting the constitution and by-laws as proposed was carried without a dissenting vote, the representatives of the American Association of Engineers requested that they be recorded as present but not voting. They made the statement that with the constitution in its present form, it would mean that their association would be obliged to give up their own welfare work, as well as contributing something like $30,000 each year to the new organization. Other addresses were made at this and subsequent sessions.

Before adjourning the meeting adopted the following resolutions:

1. Urging the payment of adequate salaries for the teachers of engineering in our technical institutions in order that adequately trained young engineering talent may be made regularly available.

2. Advocating the immediate adoption of appropriate measures to give effect to the recommendations made to Congress by the commission which recently reported upon a more adequate salary schedule for the engineering and other technical services of the federal government.

3. Indorsing the bill which has for some time been under consideration by Congress for the creation of a Department of Public Works.

4. Expressing the appreciation of the Organization Conference of the valuable work of the Engineering Council, especially its offers of assistance in making effective and operative the newly devised plan of organization; and expressing thanks to the Washington Society of Engineers and the Cosmos Club for their courtesy and assistance afforded during the sessions of the conference.

Organization of Structural Service Bureau.

A structural service bureau which will furnish structural service and data to the architectural profession and to building industries and constructors, has been organized in Philadelphia under the name of Structural Service Bureau. D. Knickerbacker Boyd, who during the war was in contact with various sections of the War Industries Board in connection with structural matters, is the bureau's "architectural advisor and structural standardist."

The principal object of the bureau is to create a greater, safer and more efficient use of building materials, equipment and devices through a better understanding of their nature, manufacture and utilization. In addition to consultations, reviews of informative literature, building code data and other services, the bureau is prepared to visit sources of production to study manufacturing methods and details, make recommendations for tests, study shapes, sizes, thicknesses, weights and space requirements; develop standards to prevent lost motion and wasted material and to prepare basic specifications and detailed drawings for the most advantageous use and the best methods of installing each product.

The Structural Service Bureau has opened quarters at Seventeenth and Walnut Streets, in the Estey Building, Philadelphia.

Special Senate Committee at Work on Reconstruction and Production Problems.

The presidents and secretaries of the fifty odd associations affiliated with the National Federation of Construction Industries, met May 20, in Philadelphia, to arrange for the preparation of statements to be submitted to the United States Senate Special Committee on Reconstruction and Production, which has recently been appointed and is particularly charged with the fostering and stimulating of construction work of all kinds.

There is a growing feeling of confidence in the work of this Senate committee among those engaged in the construction industry, those dealing in real estate, as well as among housing and labor experts, for the reason that the chairman of the committee, Senator William M. Calder, of New York, is not only a practical builder, but has a thorough knowledge of the economic conditions surrounding the industry, as well as of the national problems with which the industry must synchronize. The personnel of the Senate committee is as

follows: William M. Calder, of New York, Chairman; William S. Kenyon of Iowa; Walter E. Edge, of New York; Josiah O. Wolcott, of Delaware; and Edward J. Gay, of Louisiana. It is understood that the research work of the Senate committee is being very carefully organized in advance and is in charge of Franklin T. Miller, who is a recognized authority on the economics of the construction industry.

It is believed by many that the item of uncertainty is one of the largest items entering into the cost of construction at the present time. The labor factor is hardly more uncertain than the transportation or the financial factor. The cost of the raw material used in construction is, in itself, a very small item; it is the repeated application to the raw material of overhead, labor, transportation charges together with the speculation due to uncertainty of delivery which make up the final price to the consumer.

It is very evident that the construction industry can not function at all without capital, transportation, fuel and labor. It is equally evident that the greater the supply of these necessary elements, the more speedly will be the completion and the less the costs and the lower the rentals.

The full effect of the order of June 2, issued by the American Railroad Association, which gave preference to the shipment of coal, has not yet been fully realized. It is believed by many that this has placed a practical embargo on the movement of building materials and will bring about speculation in materials already available.

Freight rates, which in June 1918, were increased on the average of 25% on general commodities, were, it is estimated, increased 50% on some important building materials and now there is a prospect of a further increase. The ultimate cost to the consumer through increased freight rates and the uncertainty of the transportation are grasped with difficulty. In Chicago, sand is now costing from $4 to $5 a yard, and Chicago is built on sand dunes.

The recent action of the Federal Reserve Board in the curtailments of credit is being interpreted by many member banks as a further curtailment of loans on construction, but the usury laws already prevent bidding by the construction industry of interest rates in competition with the consumables and luxuries of commerce. On the other hand, rent regulating laws make housing less and less attractive to capital, and as money goes where it makes friends, which the housing shortage is accumulating.

Relief can only come through the cooperation of the transportation, financial and labor groups, and there are those who now venture to state that it cannot be realized unless new construction is exempted from taxation for a period of years.

The curtailment of construction during the war, the successive freight embargoes, the discrimination against long term loans, labor troubles, difficulty of obtaining fuel, together with the uncertainty of returns from rentals, occurring successively during the past five years, have hardly left the construction industry without some element of change or restriction for a month at a time.

To those engaged in the construction industry who believe that the very basis of credit is earning power, whether it be the earning power of the individual, the firm or a community, it is very evident that the earning power of the nation is decreasing through the continued dilapidation of its plant, and it is equally evident to them that the practical way to increase production is to increase the means of production and distribution—the tools of industry, and that the deferring of the rehabilitation of construction will not decrease the ultimate cost of the structures but will result in a continued loss to those who need to use the transportation systems, the highways and housing.

It is the hope of the optimists of the construction industry that the present necessity may greatly advance the standardization of materials used in construction, so that costs may be reduced through quantity of production and speedy assembly.

United States Chamber of Commerce Takes Referendum on Principles of Industrial Relations.

Twelve principles of industrial relations, prepared by a special committee, have been submitted to a vote of 1300 industrial and commercial organizations comprising the United States Chamber of Commerce. The principles are intended to include the fundamentals of employment relations.

The principles as submitted by the committee, declare, among other things, for the right of open-shop operation. Associations or combinations of employers or employees, it is added, must be equally subject to the authority of the State and legally responsible.

The proposed principle on the matter of wages reads:

"The wage of labor must come out of product of industry and must be earned and measured by its contribution thereto. In order that the worker, in his own and the general interest, may develop his full productive capacity, and may thereby earn at least a wage sufficient to sustain him upon a proper standard of living, it is the duty of management to co-operate with him to secure continuous employment suited to his abilities, to furnish incentive and opportunity for improvement, to provide proper safeguards for his health and safety and to encourage him in all practicable and reasonable ways to increase the value of his productive effort."

Another referendum, recently submitted to members of the United States Chamber of Commerce, contain the following recommendations:

Strikes by employes of all public service corporations, performing public service essential to the laws, health, well being and comfort of the people should be explicitly prohibited by law.

Suitable tribunals should be created by the law to adjudicate differences between employes of public service corporations and their employers, and the decisions of such tribunals should be final and binding upon both parties?

Newark (N. J.) Adopts Heating Ordinance.

Newark, N. J., has joined the growing ranks of cities in which the landlords of apartment houses and tenement buildings are required to supply sufficient heat during the heating season to keep the occupants warm.

The ordinance recently adopted, which applies also to business houses and factories in general, reads as follows:

1. It shall be the duty of every person, firm or corporation who shall have contracted or undertaken, or shall be bound, to heat or to furnish heat for any building or portion thereof, occupied as a home or place or residence of one or more persons, or as a business establishment where one or more persons are employed, to heat or to furnish heat for every occupied room in such building or portion thereof, so that a minimum temperature of 68° F. may be maintained therein at all such times. Provided, however, that the provisions of this section shall not apply to buildings or portions thereof, used and occupied for trades, businesses, or occupations where high or low temperatures are essential.

For the purpose of this section, whereever a building is heated by means of a furnace, boiler or apparatus under the control of the owner, agent or lessee of such building, such owner, agent or lessee, in the absence of a contract for agreement to the contrary shall be deemed to have contracted, undertaken, or bound himself or herself to furnish heat in accordance with the provisions of this section.

The term "at all such times" as used in this section unless otherwise provided by a contract or agreement, shall include the time between the hours of 6 o'clock in the morning and 10 o'clock in the evening in a building or portion thereof, occuiped as a home or place of residence, and during the usual working hours maintained and established in a building or portion thereof, occupied as a business establishment, each day whenever the outer temperature shall fall below 50° F.

The term "Contract," as used in this section, shall be taken to mean and include a written, verbal, or implied contract, lease or letting, and the presence of heating outlets, radiators, risers or returns in any hall or apartment or subdivision of a house, shall be prima facie evidence of an implied contract.

2. Any person, firm or corporation convicted of a violation of this ordinance, shall, on the first conviction thereof, forfeit and pay a penalty of $100, and on any second or subsequent conviction, shall forfeit and pay a penalty of $200.

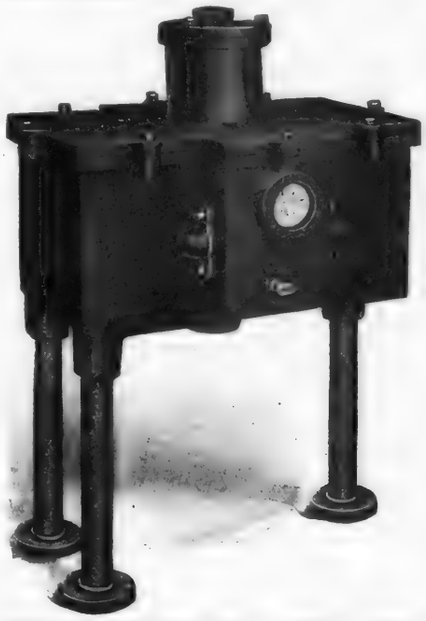
3. This ordinance shall take effect immediately.

Features of the Mason Condensation Meter.

Based on the principle that the operating cost of any steam-using product can only be figured on the condensation basis, the Mason condensation meter is offered to the trade by the Plant Engineering & Equipment Co., New York. With this device, it is stated, steam condensation losses due to shut-downs, using more steam if wet and less steam if dry, are all accounted for.

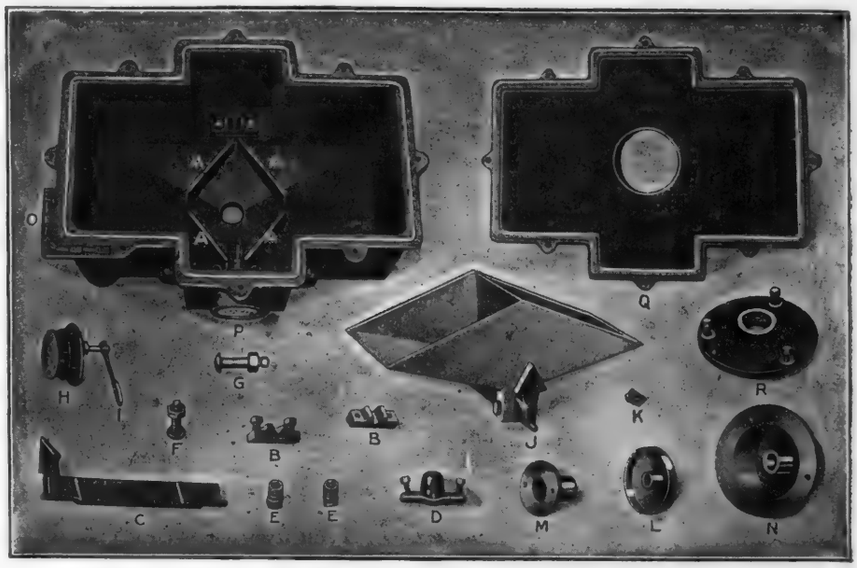
The point is made that the accurate measurement of live steam is impossible except where the density remains constant. This meter is designed to measure vapor to a maximum pressure of about 5 ozs., an important feature in measuring condensation in atmospheric or vapor heating systems. Attention is also called by the manufacturers to the low comparative cost of a unit outfit of Mason condensation meter with Corliss valve steam traps.

In construction the inlet tank of the meter is so built that the vapor is condensed and measured by the dumping bucket. The meter will not operate when steam is passing through it at a pressure exceeding 5 ozs. There is no tendency to register excessively if the condensation trap should blow steam, a feature due to the dumping type of bucket. When installed for service, the meter is intended to remain in place permanently. The setting points on the adjusting scale are located by actual water weights. This is the only occasion requiring water for testing. Should a change in adjustment be desired, the pointer key should be applied. In addition, both adjusting screws should be set to suit the required adjustment. The pointer at the top of the adjusting key locates the adjustment points on the scale over the counter housing. The length of time for such operation covers about five minutes, as it is not required to open the meter, the key being applied from the outside to the meter casing.



MASON CONDENSATION METER, WITH TRIPOD TO SET METER LEVEL.

To remove sediment from the inlet tank the binding nut supporting the clamp on the inlet neck should be released sufficiently to allow removal of inlet cover. The tank is then easily withdrawn, the sediment cleaned out and the tank replaced in its original position. Care should be taken in replacing the gaskets under and on top of the tank flange before fastening the top cover. No further cleaning is needed as the bearings are automatically lubricated by water during each discharge of the dumping bucket. No grease or oils are used for lubricating.



DUMPING BUCKET AND OTHER PARTS OF MASON CONDENSATION METER.

Constant-flow traps are used in connection with this meter. The manufacturers recommend the use of the guaranteed Corliss valve steam trap in all installations, both on account of its water-seal over the valve and the assurance of positive action, eliminating the possibility of live steam losses.

When the meter is tested for service the location of the points, as indicated on the scale by the adjusting key, are recorded. The serial number is noted at the same time.

The tripod arrangement of the supporting legs is useful in affording simplicity and accuracy in setting the meter level. The three bosses at the bottom admit of pipe nipples inserted by hand. These are used to level the meter, to set the desired elevation, etc.

Method of Obtaining Slight Differential Between Radiator and Return.

In the description of the new type of steam trap designed by Joseph F. Brightman, published in last month's issue, it was stated that the trap as designed "is the solution of an effort to obtain a thermostatic radiator trap for either gravity or vapor systems, with a slight differential between the radiator and the return."

It is suggested that possibly a better idea of the function of the trap would be to say that it is the solution of an effort to obtain a slight differential between the radiator and the return, when a thermostatic radiator trap is used on the radiators on either a gravity or a vapor system of steam circulation.

New Design of Vent Valves.

A new type of air exhaust valve, for use in connection with the Trane vapor heating system, and now furnished as part of the regular equipment, has been brought out by the Trane Co., La Crosse, Wis. The valve makes use of the principle of the Trane Thermetal Trap vent with the valve seat on top. The valve has a long plunger motion, permitting the free venting of large volumes of air.

The Thermetal trap principle has also been applied to the company's float vent trap which is used to prevent the escape of water, besides accomplishing the work done by the Trane air exhaust valve. It is designed for use in places sufficiently above the water-line to make the volume secured by the use of a receiver unnecessary. It is stated that vapor systems for disconnected garages, buildings with overhead systems and those having no basements can be better designed by using a valve of this kind. It is also used for improving the operation of poorly-designed, straight steam plants by connecting it on the end of the main return. The only difference between this valve and the Trane air exhaust valve is that it has a sliding float. This brass float with the hollow tube rests and slides upon the thermetal member pin so that the float can rise independent of the member or be forced up to it to close the plunger against the seat. Either steam striking the member, or water lifting the float will close the valve. Large ports are provided for venting the air. The aluminum disc is used to prevent air from entering the system.

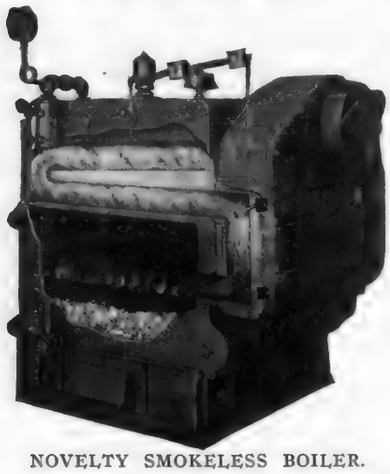
Both the air exhaust valves and the float vent traps are made in ½-in. size only, with a capacity of 1500 sq. ft. of

radiation. Where greater venting capacity is required two or more may be used.

New Design of Smokeless Boiler.

A new smokeless boiler, following original principles of design, has been brought out by the Abram Cox Stove Co., Philadelphia, Pa., under the name of the Novelty smokeless boiler. It has been characterized by the company as "the boiler with the carbureter."

The boiler has many features which stamp it as a remarkable solution of the many difficult problems involved in the burning of soft coal without smoke, at the same time retaining the necessary features of economy, low water-line, side-feed construction and ability to burn hard coal with equal ease and effectiveness. The carbureter principle embodied in this boiler is described as a new theory in boiler construction. It is incorporated in all of the twelve sizes of the Novelty side-feed boilers.



NOVELTY SMOKELESS BOILER.

The accompanying illustration shows the location of the carbureter chamber. It is designed to convert all the smoke that enters it into fully-ignited gases which pass out of the carbureting chamber and follow the normal course of travel upward, coming into contact with the other parts of the boiler's heating surface. By igniting these gases the temperature is increased so that the gases passing from the carbureting chamber have a higher temperature than the gases in the fire chamber before entering the carbureter. In this way what is indirect heating surface in the ordinary boiler becomes prime heating surface in this boiler.

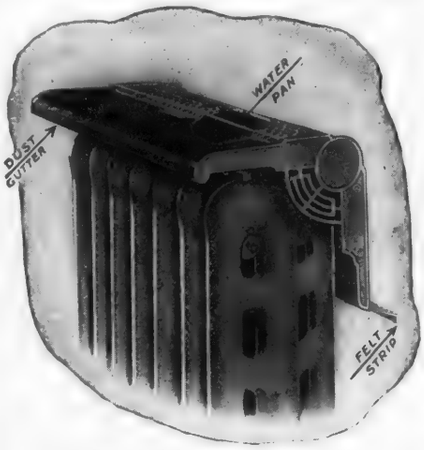
Another feature emphasized by the manufacturers is the long firing period of the boiler, ranging from eight to twelve hours, due to the slower rate of combustion. When cooling, it is stated, there is practically no effect on the steam pressure, as the gases from each new charge are immediately ignited in the carbureting chamber.

The fact that the boiler has a low water-line is a notable feature. No matter how large the boiler, the water-line remains 53 in. The boiler is of the side-feed type and is made in the 40-in. grate series with from four to fifteen sections, providing twelve sizes.

The Novelty smokeless boiler is featured in elaborately-prepared circular matter issued by the company, in which the construction and operating features are presented in colors, with detailed explanations of the boiler's numerous talking points.

Trade Literature.

ACME RADIATOR SHIELDS and register shields, manufactured by W. H. Johnson & Co., Indianapolis, Ind., are featured in newly-issued circular matter showing several types of shields, as well as comparative views of a room equipped with

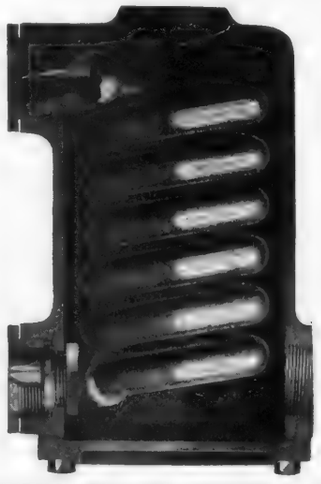


ACME RADIATOR SHIELD.

Showing flat top with water pan.

Acme radiator shields and the dusty appearance of the walls when not so equipped. The Acme radiator shield is made with the body of crimped galvanized iron, reinforced. The ends are made of cast-iron. The parts are bolted together. Provision is made for equipping the shield with a copper water pan to provide humidity to the room. The shield is supported on the radiator by cast-iron standards locked in place by a hook and bolt on each standard. The back of the shield fits tightly against the wall with a felt strip and can be extended down to the floor line, if desired.

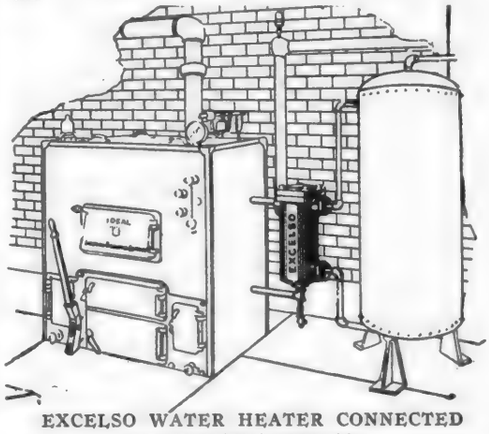
EXCELSO WATER HEATERS, described in circular matter as a new method of generating domestic hot water in connection with heating boilers, is receiving special attention in the heating trade at the present time for the reason that the latest boiler design does not provide for fire-pot coils. During the past few years, it is stated, scientific research for efficiency in heating boilers has convinced designers that the fire-pot pipe coil must be eliminated. These coils, it is found, prevent proper combustion, interfere with firing and give more or less variable results. The Excelso water heater is connected on the outside of the boiler. It is designed to heat domestic water constantly, day and night, and is so arranged that the water is never overheated or underheated so long as there is any fire in the boiler. It consists of a cast-iron shell surrounding a copper coil. The coil has ground-joint connections, so that no packing is necessary. Tapped openings in the latest type of boilers, it is stated, are made to connect the Excelso heater. It can easily be connected, however, to any heating boiler in a new or old installation. On steam



CONSTRUCTION OF EXCELSO WATER HEATER

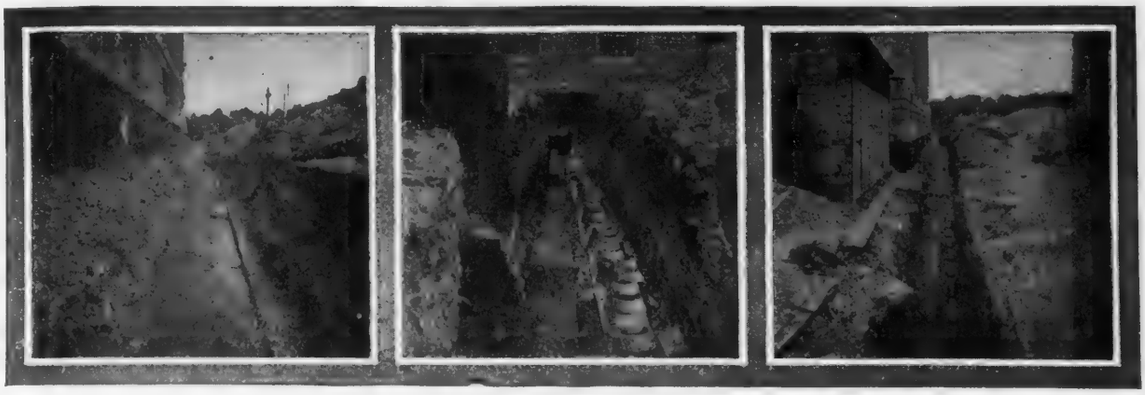
or vapor boilers the heater is connected below the water-line on the outside of the boiler, the hot water flowing through the cast-iron shell, heating the water circulating through the copper coil to from 160° to 170°. The heater is also adaptable for water heating boilers, although, of course, the temperature of hot water obtained will vary with that of the boiler temperature. The Excelso heater, which is manufactured by the Excelso boiler temperature. The Excelso heater, which is manufactured by the Excelso Specialty Works, Buffalo, N. Y., is furnished in five sizes, with capacities ranging from 40 to 120 gal.

RIC-WIL METHOD, devoted to the various types of pipe conduits manufactured by the Ric-Wil Co., Cleveland, O., is the subject of three bulletins in which the different types are presented in an usually attractive manner, the illustrations including many sectional views in colors, together with reproductions of installations and construction details in the form of blue-prints. All three bulletins are bound together under one cover. Bul-



EXCELSO WATER HEATER CONNECTED TO HEATING BOILER.

letin 1 describes Ric-Wil sectional vitrified tile conduit, Class "DA" insulation for hot water supply and return pipes placed underground for heating systems and for low-pressure steam pipes or combinations of steam and water pipes and oil-distributing systems. Bulletin 2 takes up Ric-Wil Class "DF" insulation for steam and hot water pipes placed underground for power and heating systems. This is described as a complete underground pipe-covering system. Bulletin 3 takes up in dtail the "Ric-Wil Method," including standard and typical specifications, with notes and



Trench ready for the concrete foundation. Base drain being lined up on the concrete foundation. Base drain installed and crushed rock filled in.

Pipe installed and tested. Note blocking under pipe. Bottom halves of conduit in place. Main conduit completed. Hot water pipes installed.

TYPICAL INSTALLATION OF RIC-WIL PIPE CONDUIT.

details of construction, supplemented with tables of standards. The construction notes contained in this bulletin will be found especially valuable, covering such points as grades, excavation, concrete work, backfilling, foundations under the concrete, and installation of piping. Useful rules are also given for determining the size of conduit required. The catalogue will be found a desirable addition to the data books of all who are called upon to design and install underground piping systems. Size of each bulletin, 6 x 10 in. Pp. 8 (Nos. 1 and 2); 16 (No. 3).

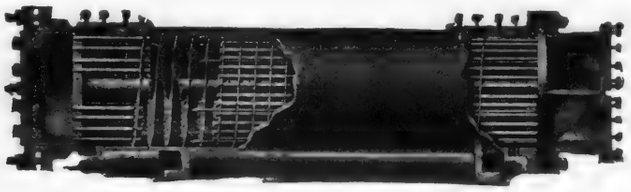
ROBERTSHAW AUTOMATIC TEMPERATURE CONTROL, designed to control temperatures by increasing or diminishing the fuel supply, is brought to the attention of the trade in a new circular issued by the Robertshaw Mfg. Co., Cleveland, O. The system is sold outright, to be installed by the buyer in accordance with the company's sketches or instructions. When the installation is made, the company places it in operation or gives the necessary instructions. The Robertshaw system is adaptable for temperatures ranging from freezing point to 3000° F., and includes over sixty sizes and types. It is designed to control all controllable fluids, vapors and solids. Included in the illustrations is one showing a Robertshaw thermostat controlling the temperature of water in a range boiler heated by an ordinary gas water heater, while another illustration shows Robertshaw thermostats controlling a temperature of 1500° F. in annealing oven fired with gas and air blast burners. A list is also given of the wide range of operations in which the system can be used, supplemented with a list of users. Size 8½ x 11 in. Pp. 4.

CLEVEOIL BURNER, for fuel-oil or kerosene, has been brought out by the Cleveland Gas Burner and Appliance Company, Cleveland, O., and is described in a newly-issued circular. It is stated that this device solves the problem caused by gas and coal shortages. The burner is designed to burn any gravity of liquid fuel, between the ranges of light crude oil and kerosene with satisfactory results, although fuel oil of the specific gravity of 0.892 or 27° Beaumé is recommended. The burner head is especially constructed to prevent the possibility of back-firing or lighting back. Its vaporizing chamber is built so that all solid matters or carbon contained in the oil may pass through with the vapor to the manifold and thence to the burner heads along with the vapor itself. Provision is made for varying the heat on the generator necessary for vaporizing the oil in the exact ratio to the amount of oil being consumed at any one time. The height or volume of the flame is controlled by a valve in direct communication with the vapor and not with the oil, allowing a wide margin of control of the desired volume of heat. There is no air control valve, the necessary amount of oxygen for combustion being introduced in the special goose-neck construction of the burner. The flame at the seat is green, while in the body it develops into an orange-blue color, ranging from 6 in. to 12 in. in height, depending upon the volume of vapor being consumed. It is stated that there are no by-products released which are not fully consumed in the flame itself. The burner may be installed in the majority of appliances through the fire-box door. The outfit includes a tank and pump, a ¼-in. pipe being used to pipe the oil from the tank to the vicinity of the burner, where the connection is made with a flexible copper tubing. Directions are included in the circular for operating the burner. The circular also contains some interesting data on the comparative cost of burning fuel-oil and coal. Size 8½x11 in. Pp. 4.

TRANE BULLETINS, including one on Trane condensation pumps, one on Trane

air-line vacuum pumps, one on Trane Thermetal traps, one on Trane direct-return traps, one on Trane graduated valves, two on Trane vapor heating and one on Trane data, all bound under one cover, make a noteworthy publication that will be found of much interest to all engaged in vapor heating work. In addition, the company issues a catalogue in the form of a set of blue prints, devoted to "Data for Heating Engineers and Architects for the Design of Vapor Heating Systems." Supplementing the data presented, eleven different plans are included showing the application of the Trane system to as many different types of buildings. Size of "Data" manual, 11 x 8½ in. Size of bulletins, each 6 x 9 in.

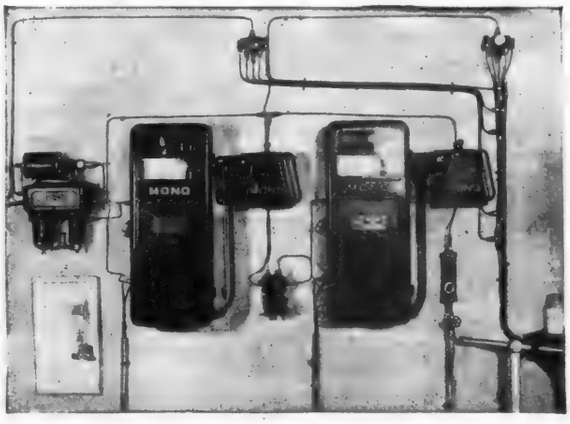
MULTIWHIRL COOLER, an ingenious device for the cooling of oil used in the lubrication of turbine bearings, reduction gears or quenching oil in the heat treating of steel, is brought to the attention of the trade in a new bulletin (No. 902) issued by the Griscom-Russell Co., New York. In either case the oil is constantly circulated through the cooler and is maintained at a constant temperature, permitting the continued use of the original quantity of oil and its maintenance at the proper viscosity for efficient results. The apparatus takes its name from the whirling path of the oil through the use of a helical



G-R MULTIWHIRL COOLER FOR COOLING LUBRICATING OIL.

baffle which directs the oil in its flow without appreciably retarding its progress. This baffle also serves to bring the oil into intimate contact with the cooling surface, thus insuring a high rate of heat transfer. The shell is of cast-iron and the tubes of seamless drawn brass or copper, expanded into a fixed tube plate at one end and into a floating head at the other end so as to permit expansion and contraction without strain on the tube joints. The cooling of quenching oil insures maintenance of the quenching bath at a fixed temperature and also permits the use of cheaper grades of oil. Size 6 x 9 in. Pp. 12.

CO_2 RECORDER that automatically record CO_2 and CO are now available according to an announcement of the Mono Corporation of America, Buffalo, N. Y. The importance of having data on each of these gases is well-known, because the percentage of CO_2 varies with the kind of fuel used, the method of firing, the method of admitting air, etc. Thus, in one installation 13% of CO_2 is the maximum that should be allowed, while in another installation 15% might be the maximum. By the use of this device, it is stated, the fireman is able constantly to see that no CO is present and that the CO_2 is always maintained at a maximum. The manufacturers of the Mono system have also devised a premium system which they will be glad to explain to any one interested.



INSTALLATION OF MONO CO_2 RECORDING SYSTEM IN BOILER ROOM.

A Plain Citizen Investigates.

A newspaper man, in one of New York's communities having heard tales of varying prices for Liberty Bonds, decided to investigate. He took a $100 third issue, 4¼% bond, and offered it for sale at a bank. There he was offered the list price in that day's quotation which was $90.17. The bank would also redeem the attached interest coupons totaling $7.86, making the entire sum of $98.03.

Since his quest was purely for information, he refused this offer, and next presented his bond to a well-known legitimate brokerage firm dealing in such securities. It made the same offer as the bank, with a fee of fifty cents for handling.

Next the investigator visited a cigar store which displayed a price quotation board in its window, but the proprietor would give only $96.57 for the bond with its interest coupons. Thence the quest went on down the line of small dealers and pawnbrokers, the prices offered gradually diminishing, the lowest one being $83 which the pawnbroker claimed was "about the current quotation," though it was in reality $7.17 less than the list price for the bond without coupons. Having learned what he wanted to know, the inquisitive soul went home and put his bond away, safely.

Deaths.

W. EMMETT CROSBY, for over 25 years executive clerk of the National Association of Master Plumbers, died in Cleveland, O., May 11, after a long illness. He had been in poor health for more than two years.

JOHN TRAINOR, a former president of the National Association of Master Plumbers and a well-known figure in both plumbing and heating circles, died June 9 at his home in Baltimore, Md. He was 66 years old. Mr. Trainor was born in Ireland. He came to this country when a young man and his entire business career has been connected with the heating and plumbing industry. He had been in business for himself since 1879. Mr. Trainor was for a long time a prominent figure in the National Association of Master Plumbers and had served on conference committees to confer with the master steam fitters' association. He was at one time a member of the State Senate of Maryland and was frequently consulted on laws bearing on sanitation and building construction. His wife died two years ago.

WANTED

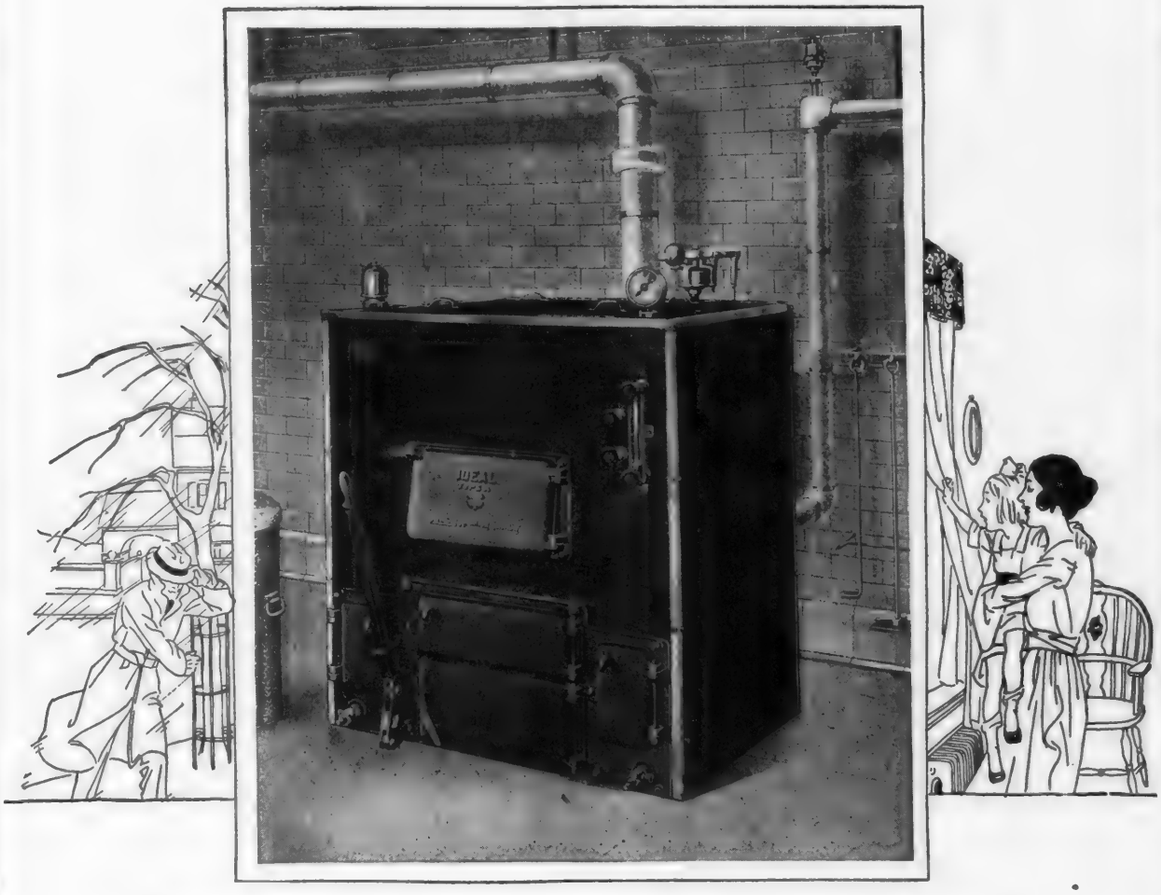
Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisements contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

Position Wanted.—By heating and ventilating engineer of thorough training and wide experience in designing, estimating and selling large and small installations of heating, ventilating and power work. Alert, dependable, thorough. Address Nassau, care of Heating and Ventilating Magazine.

Position Wanted with a New England concern by heating and ventilating engineer. Have had twelve years' experience. Am a member of the A. S. H. & V. E. and a college graduate. Salary $2700.00. Will furnish further particulars upon inquiry. Address X. Y. Z., 127 Rockland Ave., Malden, Mass.

Wanted—Two junior draftsmen. State age, experience and salary desired. Address Manhattan, care of Heating and Ventilating Magazine.

The De Luxe Heating Service



ESTIMATE by usual methods the fuel cost of warming the OLD or NEW building for a heating season. Divide by 3. The result will be the actual fuel saving that can be effected with the

New IDEAL Type "A" Heat Machine

The precise Heating Laboratory tests prove an economy and an efficiency yielding the largest interest return (33⅓ per cent) possible in any feature of household equipment. *Ask for the heat-chart catalog of IDEAL Type "A" Boilers.*

AMERICAN RADIATOR COMPANY

Sales Branches and Show Rooms in all the Large Cities.

Makers of the world-famous IDEAL Boilers and AMERICAN Radiators

VAPOR HEATING.

The Trane System.

(*Continued from Data Sheet No. 132-S.*)

The manufacturers advocate the use of a direct-return trap on all gravity plants where the radiators are equipped with traps, because on such plants there is always a difference in pressure between the supply and the return, due to the operation of the radiator trap.

The fact that the Thermetal trap (Fig. 3) is a comparatively recent development lends special interest to its construction and operation. It is a thermostatic trap, but instead of being actuated by a mass of liquid, this function is performed by a mass of metal. Through the circular construction of the operating mechanism, an unusual expansion per degree difference in temperature has been obtained, while, at the same time, a straight-line motion makes it adaptable to the ordinary type of thermostatic trap. It is also to be noted that the trap is affected by temperature only and not by pressure. This makes it an easy matter to design these traps for various differences in steam pressures.

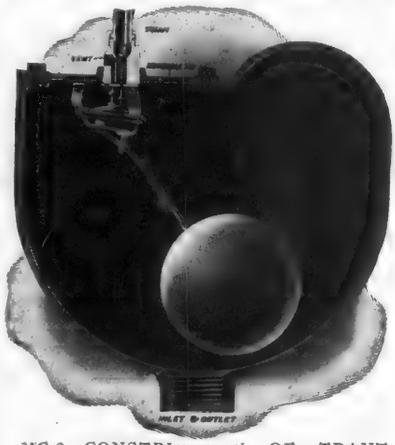


FIG.2—CONSTRUCTION OF TRANE DIRECT RETURN TRAP.

The vapor regulator, shown in Fig. 4, is connected into the steam dome or into the supply pipe on top of the boiler, and chains run from the end of the lever arm to the draft door and to the check draft in the smoke pipe. The pressure in the boiler operates on the body of water in the bottom of the regulator which, in turn, forces up the large diaphragm connected to the lever arm, closing the draft as the pressure increases, and opening it again as the boiler pressure goes down. An adjustable weight on the lever arm permits any desired boiler pressure to be maintained.

A feature of the radiator inlet valve (Fig. 5) is that opening the valve lifts the disc from the seat and at the same time raises the shell or sleeve gradually past a port in the side of the valve so that the supply of vapor to the radiator is proportioned at all times to the position of the valve handle. The sleeve rises and revolves at the same time, giving a revolving motion, and serving to keep the sleeve clean, thus preventing scratching or scoring of the valve body.

FIG. 4—VAPOR REGULATOR USED WITH TRANE SYSTEM.

Water types of radiators are used with this system, tapped top and bottom, opposite ends for first floor and the same end for upper floors. The return should have eccentric bushings.

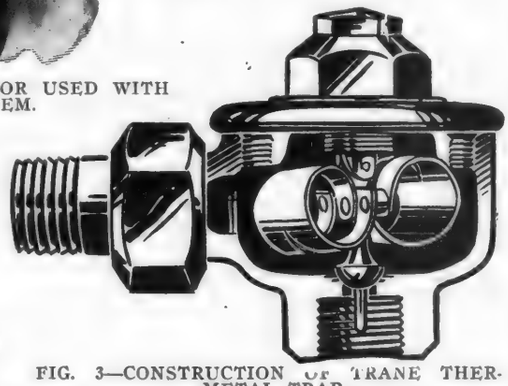


FIG. 3—CONSTRUCTION OF TRANE THERMETAL TRAP.

(*Concluded on Data Sheet No. 132-U*)

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

VAPOR HEATING.

The Trane System.

(Concluded from Data Sheet No. 132-T.)

For smaller installations of the Trane system, the company recommends the use of a receiver in place of the direct-return trap and a special return fitting at the return end of the radiator in place of the Thermetal trap.

The receiver (Fig 6) is primarily a safety device, its function being to receive the air and condensation coming back from the radiators, to vent the air from the system without permitting the escape of steam, and to return the condensation to the boiler under all operating conditions. While in the larger installations the direct-return trap is used to make the system safe, in smaller installation this is accomplished by the receiver. Under ordinary conditions, the air will be vented and the

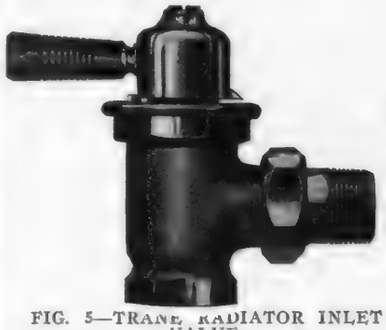


FIG. 5—TRANE RADIATOR INLET VALVE.

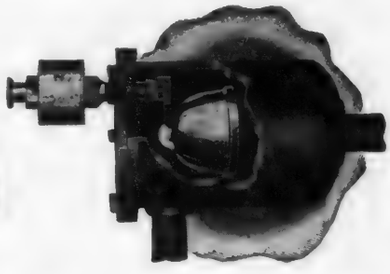
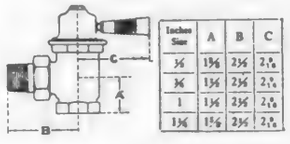


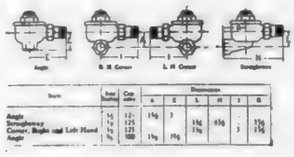
FIG. 6—RECEIVER OF TRANE SYSTEM.

condensation will return to the boiler by gravity. If the boiler pressure should happen to increase, the condensation collects in the receiver until there is a sufficient amount to raise the float. When this occurs, it closes the air vent to the atmosphere, sealing the system, and the difference in pressure between the boiler and receiver then becomes so small that the water will flow back to the boiler. This operation is automatic and will continue as long as the pressure in the system is higher than that ordinarily required. There is at the top of the receiver an exhaust valve, allowing the air to escape from the system and preventing the escape of steam.



Inches Size	A	B	C
½	1⅜	2½	2 1/16
¾	1⅜	2½	2 1/16
1	1⅜	2½	2 1/16
1¼	1⅝	2½	2 1/16

ROUGHING-IN DIMENSIONS OF TRANE RADIATOR VALVES.



ROUGHING-IN DIMENSIONS OF TRANE THERMETAL TRAPS.

The special return fitting for radiators used in smaller installations has two separate openings for the quick escape of air and water from the radiator. When these return fittings are used, the radiators should be bushed for top and bottom connections as follows:

20 sq. ft. and under..... ¾-in. x ½-in.
21 to 64 sq. ft..... ¾-in. x ¾-in.
64 sq. ft. ond over.....1 in. x ¾-in.

When Thermetal traps are used the bushings should be:

63 sq. ft. and under..... ¾-in. x ½-in.
64 to 175 sq. ft.....1 in. x ½-in.
176 sq. ft. and over..... .....1 in x ¾-in.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

WATER HEATING, GRAVITY.

Calculations for Small Systems.

For small systems it is often unnecessary to go into much detail for the sizing of the pipes, a common method being to take the valve areas of the valves on the radiator supplies and making the size of main equal to the combined areas of all the values supplied.

TABLE I

Elevation, Feet		5	15	25	35	45	55	65	75	85
Size of Pipe and Radiator Valve, In Diam.	3/4	40	50	60	70	80	90	100	110	120
	1	70	80	90	100	110	120	130	140	150
	1 1/4	110	117	135	147	170	187	205	222	240
	1 1/2	180	195	210	230	245	260	275	295	310
	2	300	375	450	500	575	650	700	777	850

NOTE—The above table shows the amount of equivalent direct radiation (E. D. R.) which can be satisfactorily fed at the elevation above the boiler given at the top of each column. "Elevation" is taken from center line of boiler to center line of radiator. Thus 180 sq. ft. situated 5 ft. above the boiler requires a 1½-in. pipe but at 55 ft. requires only a 1¼-in. pipe.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

COMPUTING HEAT LOSSES.

Heating and Ventilation Calculation Sheet.

In the accompanying heating and ventilation calculation sheet, space is allowed for four different exposures and the losses for each wall are placed opposite the proper exposures. Space is also provided for the ceiling, and floor, and also four lines for any miscellaneous items of losses of a special nature. On the bottom line below the theoretical radiator surface can be placed the actual radiation installed, and the total radiation for each sheet is placed over in the right-hand corner. These sheet totals are carried from sheet to sheet until the floor is completed. When starting on a new floor a new total is developed and carried along. On the last sheet a summary is made floor by floor, the grand total being the radiation required for the building.

HEATING & VENTILATION CALCULATION SHEETS

First Floor
Sheet No 1

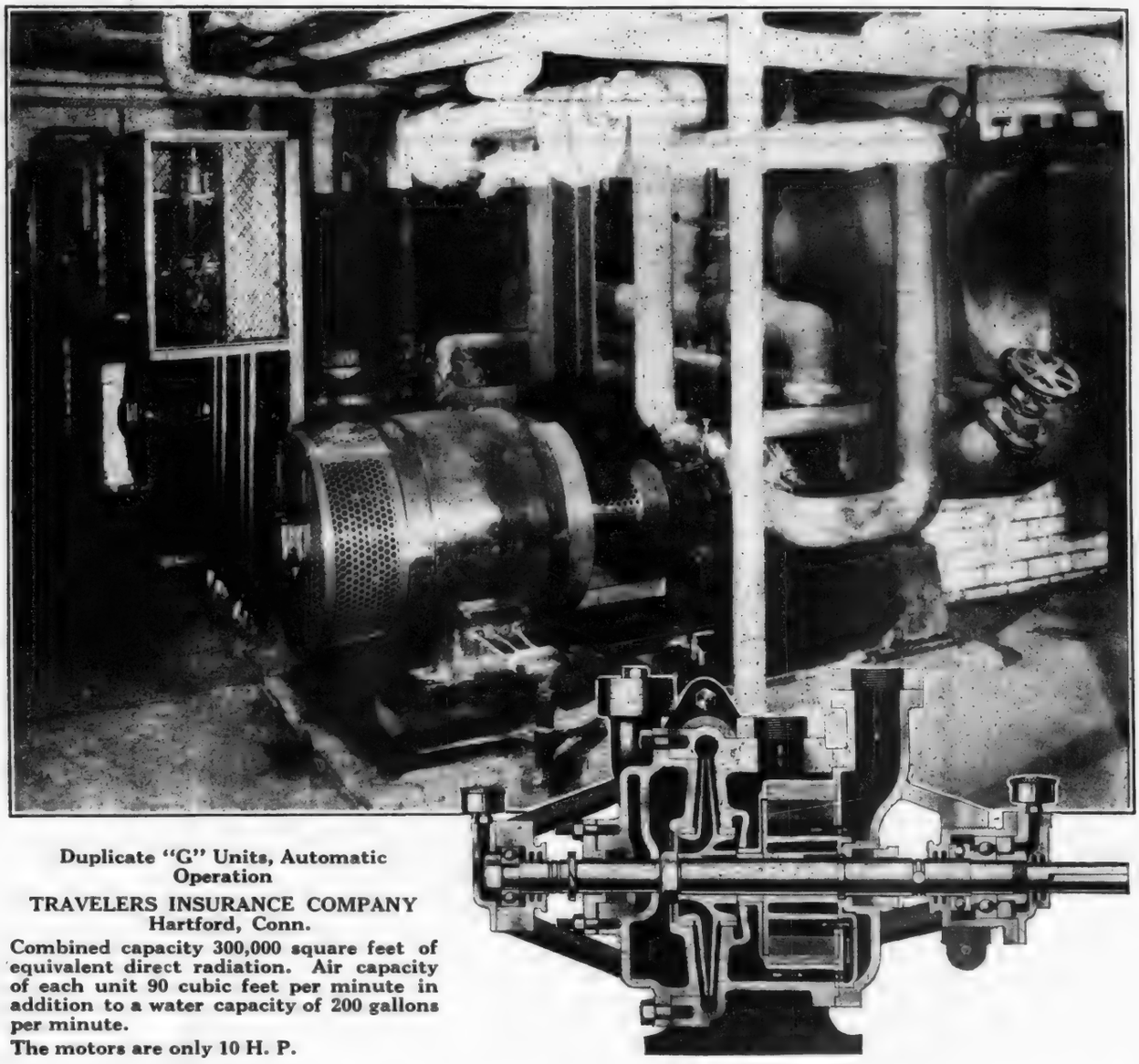
JOB John Brown's Residence — DATE May 1, 1920
LOCATION Brownsville — ESTIMATED BY H. L. G.
TEMPERATURE 0° to 70° = 70° Rise — CHECKED BY H. B.

Location of Losses			Room No. 1			Room No. 2			Room No. 3			Room No. 4		
Description of Losses		%	Sq. Ft.	Factor	B.T.U.	Sq. Ft.	Factor	B.T.U	Sq. Ft.	Factor	B.T.U.	Sq. Ft.	Factor	B.T.U.
North	GROSS WALL		200									80		
	GLASS		30	70	2100							21	70	1470
	NET WALL		170	20	3400							59	20	1180
	TOTAL				5500									2650
	EXPOSURE	20			1100									530
	TOTAL				6600									3180
West	GROSS WALL					150						100		
	GLASS					30	70	2100				30	70	2100
	NET WALL					120	20	2400				70	20	1400
	TOTAL							4500						3500
	EXPOSURE	10						450						350
	TOTAL							4950						3850
South	GROSS WALL		200						80					
	GLASS		45	70	3150				8	70	560			
	NET WALL		155	20	3100				72	20	1440			
	TOTAL				6250						2000			
	EXPOSURE													
	TOTAL				6250									
East	GROSS WALL		100											
	GLASS		15	70	1050									
	NET WALL		85	20	1700									
	TOTAL				2750									
	EXPOSURE	10			275									
	TOTAL				3025									
CEILING OR ROOF														
FLOOR			200	10	2000	150	10	1500	64	10	640	80	10	800
1½ AIR CHANGE			3000	12	3600	1500	12	1800	640	12	768	800	12	960
Miscellaneous														
GRAND TOTAL B.T.U.					21475			8250			3408			5790
RAD EFFICIECY				250				330						
Radiation Surface Theoretical					85.9			33.0			6.8			35.1
					86			32			9			36

163 sq. ft.

COMPUTING HEAT LOSSES—Heating & Ventilation Calculation Sheet | No. 5-I

EFFICIENT HEATING
demands the JENNINGS PUMP



Duplicate "G" Units, Automatic Operation

TRAVELERS INSURANCE COMPANY
Hartford, Conn.

Combined capacity 300,000 square feet of equivalent direct radiation. Air capacity of each unit 90 cubic feet per minute in addition to a water capacity of 200 gallons per minute.

The motors are only 10 H. P.

THE Jennings Pump consists of two independent turbine units, an air pump and a water pump. As each material is handled separately, the boiler pressure is against the water only. The air and vapor, approximately four-fifths of the volume handled, are delivered to atmosphere without back pressure. The saving in horse power is over fifty per cent.

Because of its compact design, this equipment can be installed in less than one-third the space necessary with other apparatus. All interior parts are bronze, supported on annular ball bearings mounted outside of casing. Moving parts revolve without contact.

There are many other reasons why the Jennings is being installed on practically all of the big jobs. Bulletin No. 8 gives them in detail. Write for it.

NASH ENGINEERING COMPANY
SO. NORWALK, CONN., U. S. A.

TRADE AND MISCELLANEOUS NOTES

Miscellaneous Notes.

New Standard Construction Classification has been adopted by the American Institute of Architects. It was prepared by the Institutes Committee on Structural Service. The classification takes in 40 items, "Heating and Ventilating" appearing as No. 30 and "Power Plant" as No. 34.

Heating and Piping Contractors' New York State Association, at its annual convention in Schenectady, May 11, elected the following officers: President, H. J. Brandeles, Utica; vice-president, C. Ashmusen, Albany; secretary-treasurer, William J. Olvany, New York; Board of Directors: C. Ashmusen, Albany; H. J. Brandeles, Utica; William F. Devendorf, Rochester; John J. Doherty, Poughkeepsie; George H. Drake, Buffalo; Edward F. Joy, Syracuse; William J. Olvany, New York; and J. R. Sheehan, Schenectady; Sergeant-at-arms, W. T. Cantwell, Utica.

May Building Operations showed a decline of 19% from the operations of the previous month, according to statistics compiled by the F. W. Dodge Company. Contracts awarded during May in the territory east of the Missouri and north of the Ohio Rivers amounted to $247,186,000, compared with over $300,000,000 for the months of March and April. It is felt that the slackening cannot be more than temporary, the principal causes being disputes over adjustments in the wage scale, principally in Chicago and the Middle West; freight congestion, which is felt principally in the East; the increasing difficulty of financing building operations, and the belief that prices of materials are due to drop. The outstanding factor in the building situation, it is added, which overshadows all the difficulties and disturbing elements, is the accumulated demand for buildings. During the first five months of 1920 the contemplated and projected work amounted to $2,500,000,000, as against contract awards amounting to half that sum. New England showed an increase of 33% over April. New York State and northern New Jersey reported a decline of 35%. The Philadelphia, Baltimore and Washington district experienced a decline of 45%. The Pittsburgh district had a decrease of 9%, the central west a decrease of 15%, and the northwest, an even break as compared with March and April. Compared with the same month of last year, the figures for New York State and northern New Jersey were $10,000,000 greater. In the Pittsburgh district the increase was over $16,000,000 compared with May, 1919. In the Northwest, which includes Minnesota and North and South Dakota, the figures were practically double those of the same month last year.

American Institute of Electrical Engineers elected the following officers at its annual business meeting, May 21: President, A. W. Berresford, Milwaukee; vice-presidents, E. H. Martindale, Cleveland; Charles Robbins, Pittsburgh; Charles S. Ruffner, New York; C. E. Magnusson, Seattle; C. S. McDowell, United States Navy; and L. T. Robinson, Schenectady; managers: E. B. Craft, New York; Harold B. Smith, Worcester; and James F. Lincoln, Cleveland; treasurer, George A. Hamil-

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45 FULTON STREET, NEW YORK

VENTILATING ENGINEERS AND CONTRACTORS

MANUFACTURERS OF

Blackman

AND

Duplex Cone Fans

COMPLETE WITH

Motors, Duct Work and Wiring

Aligning, Rigging, Hoisting

GET OUR PRICES, PROFIT BY OUR EXPERIENCE OF LONG STANDING.

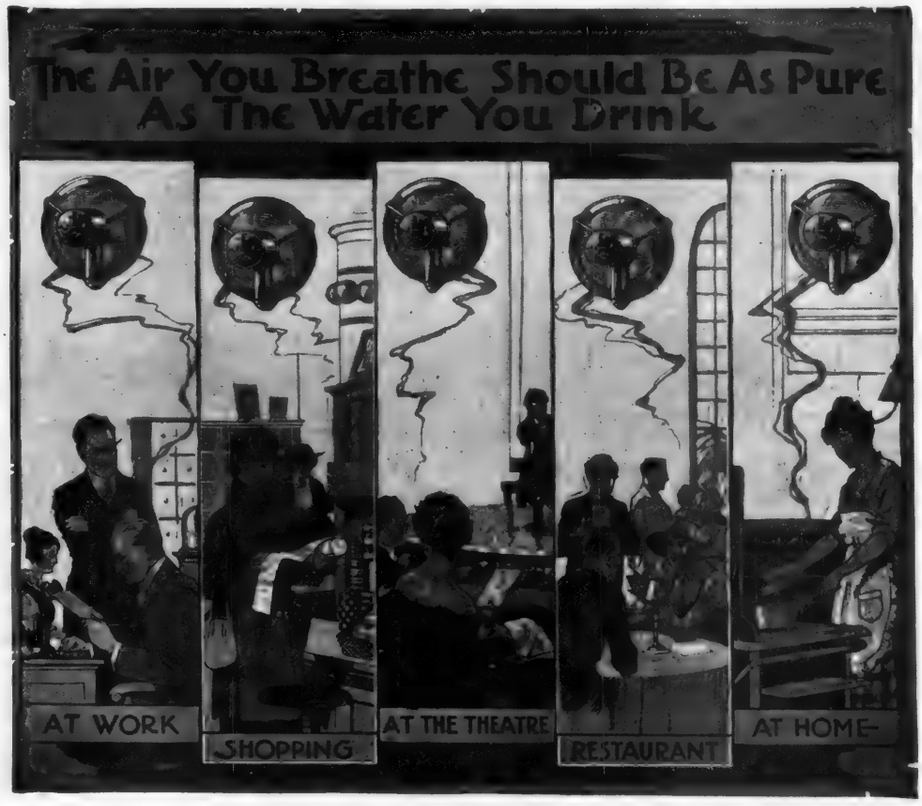
SEND FOR CATALOGUE.

ton, Elizabeth, N. J. (re-elected); secretary, F. L. Hutchinson (re-elected).

Shuman Advertising Co., Chicago, Ill., trade and technical journal specialists, have moved to larger quarters at 117 North Dearborn Street.

Soule Plumbing & Heating Co., Billings, Mont., has acquired the services of J. M. Fleming, of Denver, Colo., a well-known heating engineer of that city.

Central and Eastern Supply Associations held a joint meeting at Niagara Falls, June 9, when the question was considered of a revised nomenclature which would more clearly distinguish between merchant pipe made of soft steel and genuine wrought-iron pipe made from puddled iron. It was also the sentiment of the meeting that the tendency in certain sections of the country on the part of promotors to enlist heating contractors and plumbers in cooperative supply and manufacturing concerns was a menace to the stability of the trade, affecting both manufacturers and wholesalers. The action along this line taken by the Tennessee Association of Master Plumbers was heartily commended, namely: "That plans or schemes to organize or incorporate any league or organization of master plumbers and heaters for carrying on a plumbing and heating supply business or the manufacture of any goods used by plumbers or steamfitters is unalterably opposed and that the association should do all in its power to discourage or break up any such movement." The principal speaker at the afternoon session was Robert S. Binkerd, secretary to the president of the Association of Railway Executives, of New York. His subject was "The Present Railroad Situation." Other speakers were President A. B. Pierce of the Central Supply Association, William J. Woolley, director of the National Trade Extension Bureau; Clarence V. Kellogg, president of the National Bureau of Standardization; and George S. Drake, of Buffalo, a member of the Standardization Bureau of the National Association of Master Plumbers. The advantage of a joint session so thor-



At a very small initial cost and a few cents a day for operation, you can enjoy ideal air conditions by installing one or more ILG Self-cooled Motor Propeller Fans. Let us fully explain how ILG Ventilating Equipment can permanently banish the dangers of stagnant atmosphere, excessive heat, smoke, moisture, fumes, gases, etc.

The ILG Self-Cooled Motor Propeller Fan is the only one made with a fully enclosed self-cooled motor—scientifically cooled by a patented vent pipe which connects with the heart of motor. The guarantee covers the complete unit.

ILG Universal Blowers are built with universal discharge. Motor and blower built together—requires no foundation or pedestal—easy to install—economical to operate—one of the most efficient blowers made. We build and guarantee complete unit.

TRADE ILG MARK

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158 Whiting Street **Chicago, Ill.**

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DOLE
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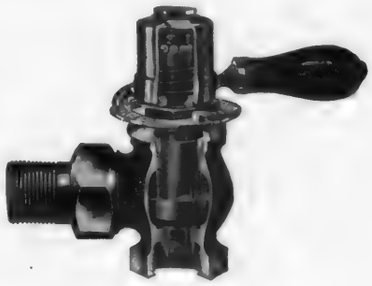
RADIATOR
VALVES

Insure Satisfaction

A Valve for Every System



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The Dole Valve Company
208 North Wells St. CHICAGO

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TRADE JENKINS MARK
Jenkins Bros

Wherever Valves are Used
the Jenkins Story is Told

Color advertising in the *Literary Digest* and space each month in *House and Garden, Country Life in America* and *House Beautiful* serve as a means of keeping the story of Jenkins Plumbing and Heating Valves before home owners and home builders. The merits and advantages of *Jenkins* installations are clearly pointed out to them.

A liberal use of space in fifty or more trade and technical magazines urging the purchase of Jenkins Valves through the trade stimulates sales for the Master plumber and steam fitter for power plant, factory and general work.

Jenkins Valves are made in types and sizes to meet all requirements. You can install them with confidence in their satisfactory performance—for each "Jenkins" is made for the maximum service not the average.

Genuine Jenkins Valves are known by the Jenkins name and "Diamond Mark."

JENKINS BROS.
New York Boston Philadelphia Pittsburgh
Chicago St. Louis San Francisco Washington
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Jenkins Valves
Since 1864 2157-J

Asbestocel
does more than just cover — it insulates!

IF you could see the heat that escapes from pipes that are merely "covered" you would put an end to the loss. But you may not realize this waste because it is invisible.

Scientific tests show waste

Careful investigations have proved again and again that there are almost incredible heat losses from poorly insulated pipes, losses that could be reduced to the minimum through the use of the proper insulation, rightly applied.

Don't just "cover"—Insulate

There's a big difference in the heat saving value of various materials, and while "covering" is usually better than nothing at all, the difference between "covering" and *insulation* often means hundreds of dollars a year.

Asbestocel is real Insulation

You can cut down heat losses to the smallest possible amount through the use of Johns-Manville Asbestocel Pipe Insulation because Asbestocel practically eliminates heat radiation.

Moreover its unique construction of many small "dead air" rings prevents circulation of heated air longitudinally out of the covering itself and adds materially to the strength and life of Asbestocel.

An efficient insulator, stronger and more durable than ordinary "covering"—Asbestocel is manifestly an economy about which you should know. Ask any Johns-Manville branch for prices and samples.

H. W. JOHNS-MANVILLE CO.
Madison Avenue at 41st Street, New York City
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CANADIAN JOHNS-MANVILLE CO., Ltd.
Toronto

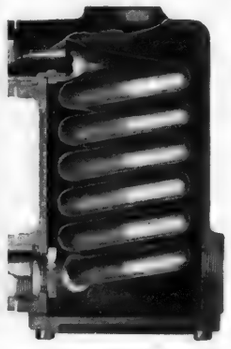
JOHNS-MANVILLE
Serves in Conservation

oughly appealed to those present that a recommendation was made and unanimously carried that the respective associations consider the advisability of holding such gatherings biennially. Over 250 participated in the joint session.

A. S. M. E. Boiler Code is brought to the attention of engineers in a special announcement issued by the American Society of Mechanical Engineers stating that a service of interest is being provided through the work of the society's standing committee "to formulate standard specifications for the construction of steam boilers and other pressure vessels and for their care in service." The report of this committee, universally known as the A. S. M. E. Boiler Code, gives rules for the construction and care of (1) new installations (power boilers and heating boilers), and (2) existing installations. Interpretations of the rules are issued periodically in "Mechanical Engineering," the monthly journal of the society, and the code and interpretations together, it is added, furnish a service covering the latest accepted methods of design and construction of steam boilers.

American Society for Testing Materials has submitted five standard specifications to the American Engineering Standards Committee, among which is one for a standard method for sampling coal. If approved they will be issued as "American Standards."

New York's transportation tie-up, which has been interfering seriously with local construction work, as well as many other business activities, has been partially relieved through the formation by the Citizens' Transportation Committee of the Merchants' Association of New York of a $100,000 corporation styled the Citizens' Trucking Company. The Citizens' Trucking Company is fully equipped in every way to carry on a trucking business, with motors, chauffeurs, helpers, garages and warehouses, as well as the organization required to handle the business. The preparation



Interior View showing Copper Coil

The New Excelso Water Heater

Eliminates Fire-Pot Pipe Coils

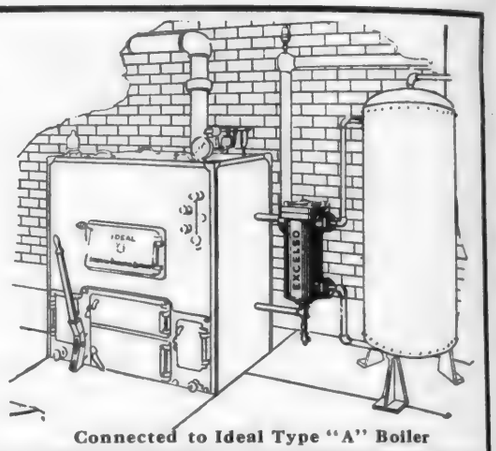
The Excelso Heater, connected below the waterline of steam or vapor boilers, will generate domestic hot water constantly, day and night, as long as there is any fire, at practically no cost.

The copper coil is connected into heater without packing. Made in five sizes for tank capacities as follows:

No. 1	No. 2	No. 3	No. 4	No. 5
30 gal.	45 gal.	70 gal.	90 gal.	120 gal.

EXCELSO SPECIALTY WORKS

119 Clinton St. Buffalo, N. Y.

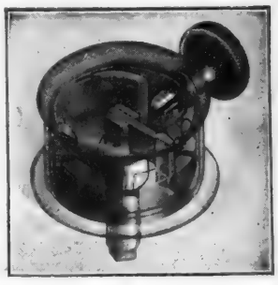


Connected to Ideal Type "A" Boiler

HERE IS THE SOLUTION

OF YOUR DAMPER REGULATOR PROBLEM

THE PERFECTO DAMPER REGULATOR AND INDICATOR



Positively regulates the supply of hot or tempered air in heating and ventilating systems.

The Perfecto Damper Regulator and Indicator shows the position of the damper in the pipe and is provided with lettered or numbered cover windows to correspond with the rooms to which the various pipes lead.

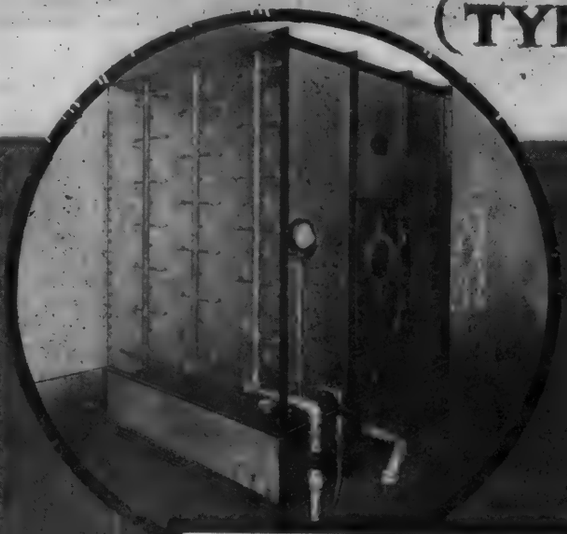
The Perfecto Damper Regulator and Indicator effectively prevents any unauthorized person from tampering with the temperature control adjustment.

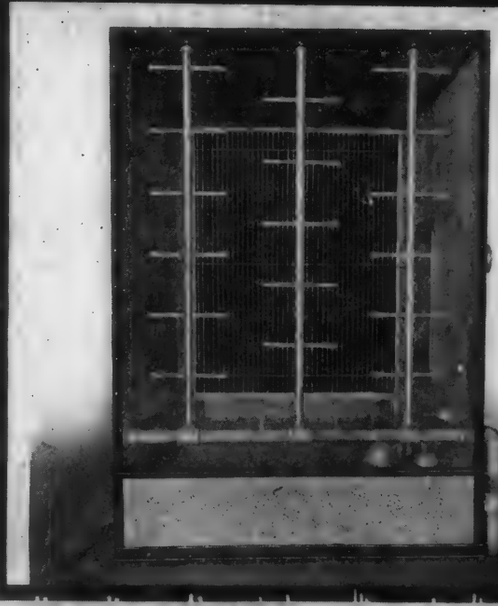
The Perfecto Damper Regulator and Indicator may be placed on the wall of a room where the ventilating ducts are concealed within the wall and the damper connected to it by an extension of the square damper rod. This arrangement is especially useful in school rooms to control the inflow of tempered air and exhaust of vitiated air. When the damper is set by the engineer or janitor it cannot be altered by anyone except the person in charge of the heating and ventilating system.

THE SIXTH CITY SHEET METAL WORKS CO.

Cleveland, Ohio

SPRACO
AIR WASHERS
(TYPE "C")





The NOZZLE Does the Work if it is a Spraco Center Jet Nozzle

The SPRACO CENTER JET NOZZLE presents a dense massive spray blanket of completely atomized water that leaves not a single atom of air unwashed.

And, which is of fully as great importance, the SPRACO TYPE C AIR WASHER means CONTINUOUS and DEPENDABLE OPERATION. The four turbine blades and the driving center jet has enabled the SPRACO NOZZLE to demonstrate in actual competitive test that the SPRACO CENTER JET NOZZLE continues to spray after all others have been clogged with sediment.

Highest grade material and workmanship insure lasting service.

Write for Bulletin on "Type C" SPRACO AIR WASHER.

Spray Engineering Company
Boston, Mass.

Mfgrs. also of Spraco Cooling Ponds, Spraco Paint Guns and Cement Guns, Spraco Nozzles, Vaughan Flow Meters, etc.

THE·CENTER·JET·NOZZLE
Highest Efficiency by Test

was completed under the direction of Colonel F. A. Molitor, who commanded the Twenty-Second Engineers in France. In connection with the refusal of certain steamship companies to receive freight delivered by non-union labor, a decision has been rendered by Justice Fawcett in the Supreme Court in Brooklyn, in which he declares that discrimination against merchandise not approved by union labor is a crime, and he enjoins such discrimination.

National Bureau of Standardization, which is undertaking to standardize various classes of plumbing materials, held a one-day session in Chicago, May 12, when a report was received from the Cast-Iron Soil Pipe and Fittings Committee, represented by C. A. Schultz. He stated that the committee was not ready to present a full report, but that it had reached the opinion that 5-in. and 7-in. standard and extra-heavy cast-iron soil pipe can be eliminated. For the Brass Manufacturers' Committee, Adolph Mueller stated that the committee was opposed to the elimination of the ⅜-in. size.

Manufacturers' Notes.

Kewanee Boiler Company's new plant in Kewanee is approaching completion.

Kelsey Heating Co., Syracuse, N. Y. has been reorganized through the purchase of a large block of the capital stock by Levi S. Chapman. R. H. Bradley has been elected president and general manager. A new corporation will be formed with an increased capital stock. The business of the company, Mr. Bradley states, was never as promising as at present. A 100% increase in shipments has been made, with foreign and domestic inquiries greatly in excess of the number received in former years. The company manufactures the Kelsey warm air generator.

Vesuvius Engineering Co., New York, manufacturer of heating units for hot water or steam service using gas fuel, has taken quarters in the Grand Central Palace, Forty-seventh Street and Lexington Avenue. David H. Cuyler is president of the company.

Hersh Bros. Co., Allentown, Pa., who succeeded to the business of the Bicalky Fan Co., Buffalo, N. Y., announces that its fans and equipment, heretofore known by the name of "Bi-cal-ky" will hereafter be sold under the name of "Lehigh." The company is issuing a new engineering catalogue which will be out shortly.

Clarence M. Woolley, president of the American Radiator Co., Chicago, will be eelcted a director of the General Motors Corporation, according to an announcement issued by Edward R. Stettinius, of J. P. Morgan & Co., New York.

Greenfield Tap & Die Corporation, Greenfield, Mass., has acquired the common stock of the Lincoln Twist Drill Co., Taunton, Mass. The company is now equipped to manufacture a complete line of taps, dies, reamers and twist drills.

Powers Regulator Co., Chicago, has moved its main offices and factory into its new building at 2716-2720 Greenwood Avenue and Diversey Boulevard.

Atlantic Radiator Co., New York, is in the hands of a receiver. The business of the company has been conducted for several years at 359 West 42nd Street.

Chicago Pump Co., Chicago, Ill., has taken possession of its new plant at 2322 Wolfram Street, Chicago. A floor space of 25,000 sq. ft. has been provided in the new building, while adjacent land has been purchased for the erection of an addition. The new plant represents ten years of progress since the company started operations in a small store in Chicago. The equipment of the building includes a testing department for testing each pump at the capacity at which it is to be operated.

Cochran-Sargent Co.'s heating and supply house in Sioux Falls, S. D., was destroyed by fire May 8. The company's main office is in St. Paul, Minn. Already new quarters have been secured in Sioux Falls and stocked with supplies from the St. Paul headquarters.

L. S. Shaw & Co., Cleveland, O.,

Pat'd May 26, 1908

CYCLOIDAL MULTIVANE FANS

FULFILL THE ENGINEERS' OBLIGATION TO THE USERS

EFFICIENT — NOISELESS — DURABLE

Built along scientific lines—of high grade materials and best of workmanship. This coupled with our forty years experience in the manufacture of fans of all types—GUARANTEES

PERFECT SATISFACTION

SECTIONAL CATALOG NO. 120 CONTAINS CAPACITY TABLES, DIMENSIONS AND FURTHER DETAILS

Garden City Fan Co.
Est. 1879
CHICAGO, ILL.

THE MARK OF HIGH EFFICIENCY
Cycloidal

"Sirocco"

TRADE MARK

In Industrial Plants

There is only one best method for the new industrial plant. That is a proper system of ventilation which insures pure, clear air to all departments during every working hour.

At the Delco Plant, Dayton, Ohio, two systems are in use. In one department Sirocco Exhaust Fans are used to carry away dust from the buffing wheels. In another department Sirocco Fans furnish clear, fresh air, keeping the department in just the right condition for best results. Today greater attention is being given the ventilating question than ever before.

If you are working on a particular problem in which Sirocco equipment is being considered, one of our sales engineers, located near you, will be glad to talk over the proposition with you.

AMERICAN BLOWER COMPANY
Detroit, Michigan

manufacturers of the Shaw system for better operation of steam boilers, are now located at 510 Meriam Building, 5716 Euclid Avenue, Cleveland.

Pittsburgh Engineering Co. announces that it has purchased the plant of the Greenburg Foundry & Machine Co., in Jeannette, Pa., which provides the company with the means of manufacturing its entire line of specialties and gives assurance that they will be made from the best materials and receive expert workmanship. The company states that it will carry a large stock of finished goods and will be in a position to make prompt shipments of any requirements in its line. The company's branch offices will be maintained as in the past, but the company's general offices will hereafter be located in Jeannette.

Trane Co., manufacturers of the Trane Thermetal traps and other heating specialties used in the Trane system of vapor heating, has moved its general offices and factory from South Sixth Street, La Crosse, Wis., to its new plant at 202-216 Cameron Avenue, La Crosse. The removal became necessary to secure largely-increased production due to the company's heavy volume of business. The management reports that the current year will outdistance the best year the company has had since its organization in 1883.

Walworth Mfg. Co., Boston, Mass., announces several changes in its personnel: F. B. DeLong has been advanced to the position of manager of the company's Seattle branch. E. A. Neuport has been appointed assistant manager of the Seattle branch, succeeding Mr. DeLong. C. W. Watson goes from the company's Kewanee works to the western division as assistant manager of sales. A. O. Nobling has been made manager of the order department of the company's western division.

New Firms and Business Changes.

J. E. Edwards & Son, Allentown, Pa., is the title of a new engineering firm with offices at 610 Hamilton Street. J. E. Edwards has been connected for the past 30 years with William H. Taylor & Co., and was latterly in charge of the engineering department. His son, J. Beaumont Edwards, is a graduate of Lehigh University, and has had five years' practical engineering experience. At present he is superintendent of the power plant at Camp Meade. The new firm will specialize in heating, ventilating and complete power plants and will also deal in mill supplies.

Westover Heating Co., Portland, Ore., with a capital stock of $30,000, is being organized to take over the business of the Portland Central Heating Company. The latter company manufactured ice, as well as heat, and, it is stated, this venture proved so costly as to force it into the hands of a receiver. The Westover Heating Company, with new management, and with ample funds, will reorganize and continue the business.

Lehigh Valley Supply Co., Allentown, Pa., has been organized to conduct a heating and plumbing supply business. The new company has taken quarters at Third and Oak Streets. President, John Fleck, of Fleck Bros. Co.; treasurer, J. Walter Singmaster, of the East Penn Foundry Co., Macungie; secretary, William Fleck, of Fleck Bros. The Allentown corporation of one of a chain of stores in Norfolk, Baltimore, Philadelphia, Reading and Easton. It will specialize in American Radiator Company equipment, Trenton Pottery Company products and Standard Sanitary Company fittings.

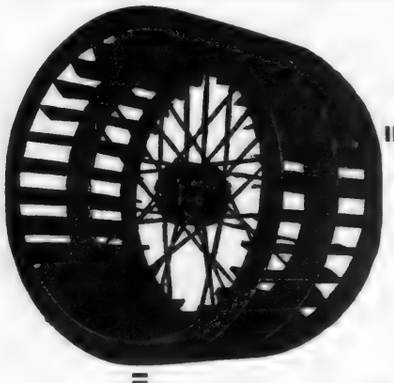
EXCELSO SPECIALTY WORKS, Buffalo, N. Y., manufacturer of the Excelso water heater, has moved to new quarters at 119 Clinton St., Buffalo.

WALTER E. GILLHAM, consulting heating and ventilating engineer, Kansas City, Mo., has moved his offices to new quarters at 309 Mutual Building, Kansas City.

Power Plant Supply Co., Cleveland, O., capital $20,000. Incorporators: C. M. Muss, C. A. Niman, W. T. Holloday, W. A. McAfee and I. Grossman.

Contracts Awarded.

P. J. Gallagher, Fairbault, Minn., heating, ventilating and plumbing for new high school building in Albert Lea, Minn., for $91,833.



Look Into It

Investigate Bayley equipment when you have heating and ventilating problems to solve. The principles and construction employed in Bayley Equipment represent the latest developments in Air Engineering.

Our experienced engineers will assist you to plan out installations to suit any building.

Write for bulletins on Bayley Plexiform Fans, Bayley Chinook Heaters and Bayley "B" Exhaust Fans.

BAYLEY MFG. CO.

732 Greenbush St. Milwaukee, Wis.

FRESH AIR

is industrial health insurance

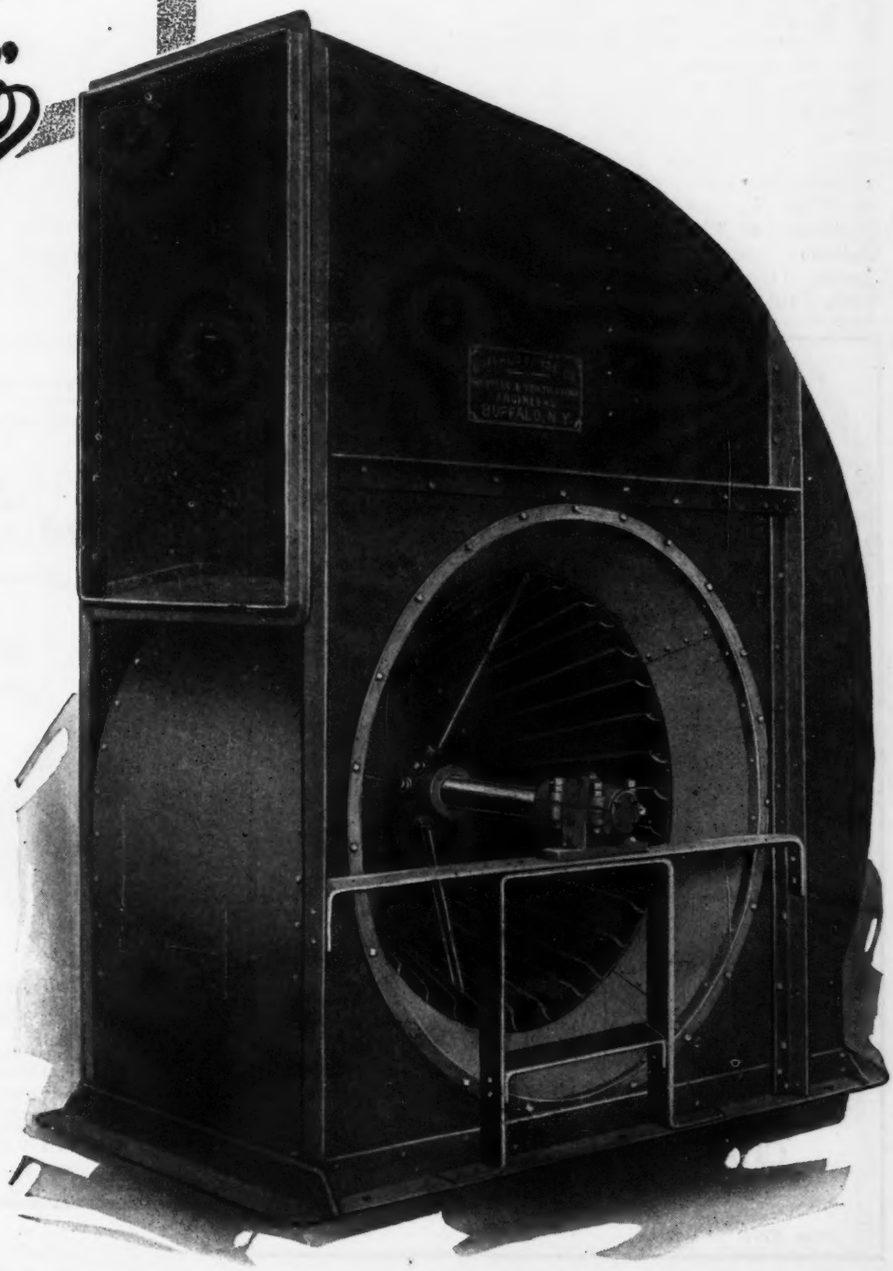
Before making your recommendations for Heating and Ventilating apparatus, consider Buffalo.

Let our engineering department help you with your problem. Their vast fund of practical knowledge is at your disposal.

Write Dept. 36 for our catalog — it is replete with valuable engineering data and table.

BUFFALO FORGE COMPANY
BUFFALO, N. Y.

"Buffalo"



Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Central Station Heating Notes.

Belvidere, Ill.—Owing to the difficulty of securing a sufficient number of subscriptions to finance the proposed new central heating plant in Belvidere, a new project has been proposed by Attorney W. L. Pierce, which involves using exhaust steam from the city's waterworks. A committee of the city council has been appointed to confer with a committee of the new heating organization. Mr. Pierce stated that there was no question that the city had the power under the law passed in 1913 to make and sell light, heat, power and other things to individuals and companies. With regard to the pending heating proposition he stated that $50,000 had been subscribed and that if necessary the balance of the needed funds could be borrowed.

Boise, Idaho.—The Idaho Power Company has filed a petition with the public utilities commission for uniform rates in all its territory for power sold for air and water heating. Accompanying a schedule of rates the petition recites the circumstances under which it has fallen heir to schedules previously established by its predecessors in various parts of Idaho and eastern Oregon. Especially in the Twin Falls division the company has found the rates as established by its predecessor, the Great Shoshone and Twin Falls Water Power Company, unprofitable. The principal change, if one is ordered, will be in the Twin Falls district, where there is a large number of domestic and commercial users of power for heating purposes. The petition of the company is considered an attempt to bring the rates in that district up to those prevailing in most other parts of its territory.

Goshen, Ind.—The building of a central steam heating plant for the business district of Goshen is under discussion by a number of prominent business men. In accordance with a tentative plan, the boilers at the city water and light plant can be used, as the city, it is said, plans to operate the water plant by electricity. In the event that a contract can be entered into with the city for the use of the boilers in the city water plant, a company will probably be organized to lay the steam pipes from the plant to the business district. The cost of laying the steam pipes and putting the plant into operation is estimated at $100,000.

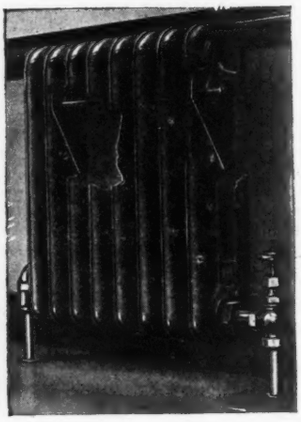
La Crosse, Wis.—Because the Wisconsin-Minnesota Light & Power Company has failed to install thermostats on its central heating services in this city, in compliance with an order of the Railroad Commission of Wisconsin, the State board has asked the attorney-general to take action to collect penalties provided under the law. Although the time limit was reached some time ago on this order, it is stated that the company has not only made no move towards compliance but also that its representatives have stated that they would not comply with the order voluntarily.

San Francisco, Cal.—Preferential rates for steam heat enjoyed by apartment houses, hotels and clubs in San Francisco and Oakland were canceled June 1 and the rates increased from 50% to 100%, according to a ruling handed down by the State Railroad Commission. The commission ordered the Pacific Gas and Electric Company and the Great Western Power Company to put into effect on that date a uniform new schedule of rates. Apartment houses and buildings that have been getting steam at a low figure because they gave the company supplying the steam their electric business will, now, have to pay for steam at a rate that will mean an increase of from 50% to 100%, depending on the terms of their contracts. The commission's order abrogating the special contracts is based on the amendment to the public utilities act passed by the last legislature, placing heat corporations under the jurisdiction of the railroad commission.

The new rates fixed by the commission place a minimum monthly charge of $1 per 100 sq. ft. of direct radiation, and a minimum charge of $7.50 a meter. A sliding scale for steam is fixed depending upon the amount used.

Madison, Wis.—Permission has been given the Wisconsin Gas & Electric Company by the State railroad commission to discontinue its central station heating service in Kenosha. In reviewing the case the commission cites the fact that the plant is in a badly run

HARTMANN
RADIATOR
BRACKETS



WHYS

LABOR SAVED

NO WALL STRIPS

NO BREAKAGE

NO DIRT

INEXPENSIVE

Send for descriptive circular and price list

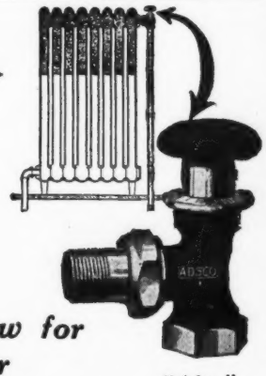
CHARLES HARTMANN CO.
SHEET METAL CONSTRUCTORS
985 Dean St., Brooklyn, N. Y.
(Pros. 8274)

Note the Dividing Line

Steam above

Air below

"Adsco" Heating Saves 20 to 30% Fuel Cost



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"Adsco" Graduated Radiator Valve

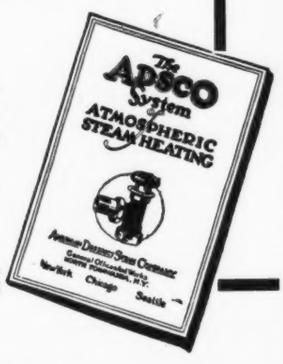
"Adsco" Damper Regulator

The "Adsco" System of Atmospheric Steam Heating costs 15 to 20% less to install than most other systems. Its perfect control of heating surface saves 20 to 30% fuel cost.

No air valves, steam or return traps, or other complicated devices. Nothing to cause noise.

Write for Bulletin No. 150-H

For homes, offices, factories and other buildings write for Bulletin 150-H. If you are interested in heating a group of buildings or industrial homes, ask for catalog on "Central Station Heating."



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CAPITOL THEATRE NEW YORK

IN this the most modern and up-to-date and perhaps the finest theatre of its kind in the world,

Massachusetts Fans

were selected to take care of the fresh air supply and exhaust systems. Seven large "Squirrel Cage" fans and two Massachusetts Davidson propeller fans were installed, the four main fans supplying and exhausting respectively 140,000 cubic feet of air per minute, while the smaller fans exhaust 20,000 cubic feet of air per minute from the lavatories, smoking room, etc. One hundred horse power is required to operate the plant.

Where may we send you ALL the facts on MASSACHUSETTS FANS?

MASSACHUSETTS BLOWER CO.
WATERTOWN, MASS.

down condition, that the leakage expense alone is estimated to mean a loss of $5,562 per heating season, that the number of patrons has decreased approximately 33% and that to provide adequate service would require practically the entire rebuilding of the piping system at a great expense. Attention is called to the fact that, despite many protests against a discontinuance of the service, advertisements in the Kenosha papers for applications for service during the next heating season brought a surprisingly small number of responses. At one time the company had 90 patrons but in 1919 they had dropped to 61 and only a small portion of those have applied for service the next season.

Hazelton, Pa.—After being in business for 25 years, the Hazelton Steam Heating Company has closed its affairs and discontinued its business, owing, it is stated, to the unprofitable nature of the investment. This will necessitate the installation of private heating plants in most of the business houses in the central section of the city. The heating company is a subsidiary of the Harwood Electric Company and shortly before the war, completely re-equipped its system at an expense of $100,000. Testimony given before the Public Service Commission, when objections were heard to radical advances in rates, showed that the year before last the concern realized a profit of but $6.00.

PATENT FOR SALE

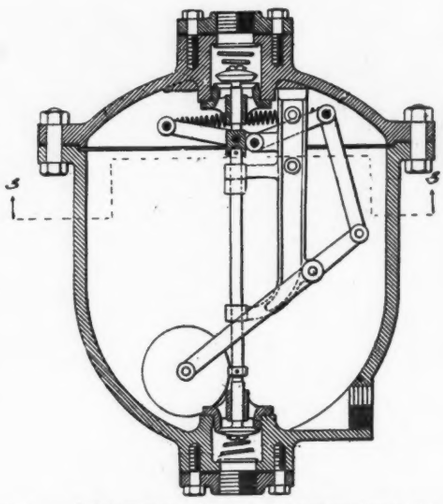


FIG. 1—CONSTRUCTION OF BRIGHTMAN STEAM TRAP.

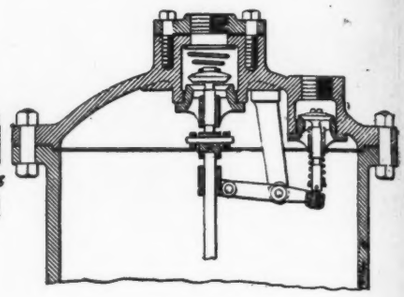


FIG. 2—VIEW OF TRAP SHOWING THIRD VALVE.

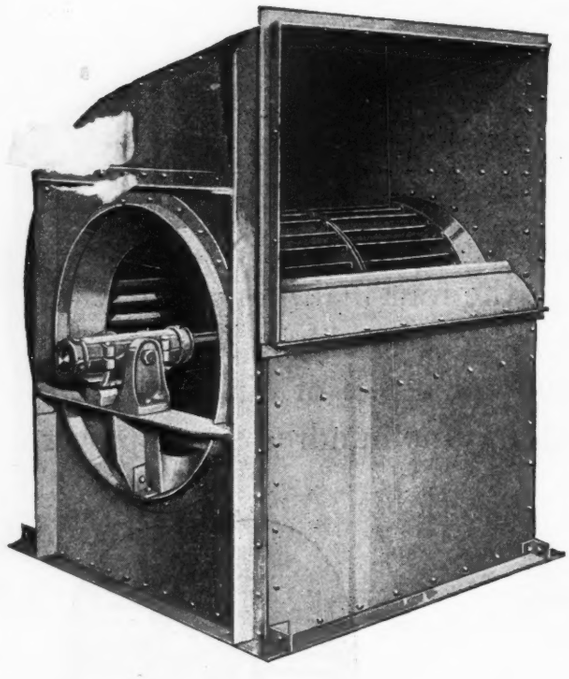
U. S. Patent 1,328,939
Issued Jan. 13, 1920
Patent applied for in Canada

I WILL SELL to the highest bidder my patent for above return trap which was was fully explained in an article published in the June issue of this magazine.

COMPLETE INFORMATION WILL BE GIVEN

Address all letters for copy of patent to

JOS. F. BRIGHTMAN, 629 Mercantile Bldg., ROCHESTER, N. Y.



Cut shows double width double inlet
SERI-VANE FAN TYPE C
full housed overhung pulley

Seri-Vane Fans

Write for our latest catalogue Number 70 describing our

Seri-Vane Fans Type C

A special SERI-VANE FAN is made just for that fan problem you have.

We specialize in complete installations for the drying of brick, lumber, powder, gelatine, glue paper, leather, etc.

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